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It is with very deep regret we have to record the death from influenza on April 4th, 1943, of Sir Edwin John Butler, C.M.G., C.I.E., F.R.S., Director of the Imperial Mycological Institute from 1920 to 1935.

TEHON (L. R.). **Can we reproduce Saccardo's Sylloge Fungorum?**—*Mycologia*, xxxiv, 5, pp. 592–593, 1942.

The author invites the opinion of mycologists on the proposed reproduction of Saccardo's Sylloge Fungorum, which can be made available in complete sets at the very moderate cost of about $30 to $40 each, provided as few as 50 advance subscriptions are obtained. The process of reproduction, known as the Readex Microprint, furnishes actual printed pages of a much reduced size. For the reading of these, a special patented apparatus (present price $225.00) is required, which throws the reproduced page on to a glass screen at a convenient reading distance and at a normal page size. It is suggested that the reading apparatus with its powerful surface illumination and magnification of about 10 to 16 diameters would be generally useful in research laboratories and for teaching, while its price, added to that of the reproduction, still constitutes only a small fraction of the cost of an original copy of the Sylloge, if such were available. The writer would appreciate assurances that individuals or institutions would subscribe for a microprint set of the Sylloge.

HONEY (E. E.). **Monilinia amelanchieris.**—*Mycologia*, xxxiv, 5, pp. 575–578, 1942.

The author fully describes the perfect and the conidial stages of the fungus originally collected by Reade in 1907 near Ithaca, New York State, and later observed by the author in the same locality on *Amelanchier intermedia* and other *A.* species, under the names of *Monilinia amelanchieris* and *Monilia amelanchieris*, respectively. A more extended paper on this study is being prepared for publication.

SEAVER (F. J.) & WATERSTON (J. M.). **Contributions to the mycoflora of Bermuda—III.**—*Mycologia*, xxxiv, 5, pp. 515–524, 3 figs., 1942.

This annotated list of 25 fungi collected in Bermuda during 1940 includes two new species. *Sclerotinia sclerotiorum* was found for the first time locally on banana, the only previous record on this host being that by Reichert and Hellinger from Palestine [*R.A.M.*, x, p. 117]. *Botryosphaeria ribis* is recorded on cassava, apparently a new host for this fungus. Inoculation experiments proved *B. ribis* to be weakly parasitic. *Diplodia* [*Botryodiplodia*] *theobromae* was found responsible for considerable wastage to tubers of cassava, entering the plants through cracks caused by wind.

WHIFFEN (ALMA J.). **A discussion of some species of Olpidiopsis and Pseudolpidium.**—*Amer. J. Bot.*, xxix, 8, pp. 607–611, 27 figs., 1942.

By using boiled grass leaves as a bait for Chytrids in soil and water collections a

number of species of *Pythium*, one of *Aphanomyces*, and parasites of these were obtained.

A study of *Pseudolpidium gracile*, parasitic on *Pythium rostratum*, found in a soil collection in Florida confirmed Butler's observation (*Mem. Dep. Agric. India*, Bot. Ser., i, 5, pp. 1–160, 1907) that the resting body had no companion cell. *Olpidiopsis aphanomycis* Cornu, parasitic in *Aphanomyces cladogamus* from soil near Petahatche, Mississippi, also formed resting bodies lacking in companion cells. Diagnoses are given of *O. curvispinosa* n.sp. and *O. brevispinosa* n.sp. parasitic on two different species of *Pythium*, in North Carolina and Louisiana, respectively. It was not found possible to transfer any of these species of *Olpidiopsis* from the host on which it had been collected to that of any other of these four species.

Whiffen (Alma J.). **Two new Chytrid genera.**—*Mycologia*, xxxiv, 5, pp. 543–557, 52 figs., 1942.

The author establishes two new genera, *Solutoparies* and *Septosperma*, belonging to the Rhizidiaceae. The type species of the former, *Solutoparies pythii*, is described as an exoparasite of an undetermined *Pythium* sp., isolated in 1940 from soil at Chapel Hill, North Carolina.

Indian Tea Association. Scientific Department. Annual Report—1941.—10 pp., 1942.

Various treatments were applied at the Tocklai Experimental Station for the control of branch cankers of tea, which in north-east India are usually due to sun scorch [cf. *R.A.M.*, xv, p. 780]. Fitting thatched shade over the bushes to exclude sun from the branches resulted in a reduction of 68 per cent. in the incidence of the disorder, the corresponding figures for whitewashing all branches exposed to the southern and western sun, and replacing all branches cut off in the medium pruning on the top of the bush, being 65 and 30 per cent., respectively, and for a combination of all three methods, 80 per cent. High-yielding bushes were found to be more liable to sun scorch than unproductive ones. In another test, in which half the bushes medium-pruned in September were shaded by *Boga medeloa* and the other half left unprotected, the latter were severely scorched in November, while the former were scarcely affected. Pruning in September and October resulted in a much higher incidence of sun scorch than the same operation in November, December, and January, the numbers of bushes affected (out of 540 in each instance) in the five months being 228, 247, 28, 42, and 47, respectively.

Diachun (S.), Valleau (W. D.), & Johnson (E. M.). **Entrance of non-motile bacteria and chemicals into water-soaked Tobacco leaves.**—Abs. in *J. Bact.*, xliv, 3, pp. 387–388, 1942.

In tests conducted at the Kentucky Agricultural Experiment Station to determine whether the leaf-spotting bacteria of tobacco [*Pseudomonas tabaca* and *P. angulata*] enter the foliage of their host by means of their own motility, or are carried in by the action of some external force [*R.A.M.*, xxi, p. 540], non-motile organisms (*Staphylococcus aureus*) were placed on water-soaked and normal tissues of the same leaf. On the disappearance (within half an hour) of the water-soaking, the leaf surface was sterilized with mercuric chloride and excised, macerated fragments mixed with agar in Petri dishes. Within a few days thousands of colonies of *S. aureus* developed on each plate prepared from water-soaked tissues, whereas none grew on the controls. Swimming is therefore unnecessary for the bacterial invasion of foliage. The water-soaked tissues were further penetrated by India ink, inducing an ineradicable blackening, and by mercuric chloride, copper sulphate, and Bordeaux mixture, which resulted in necrosis. These observations suggest the intervention of naturally induced water-soaking in the causation of spray injury.

ANDERSON (P. J.). **Control of blue mold of Tobacco by a new spray.**—*Science*, N.S., xcvi, 2496, p. 409, 1942.

The information given in this paper on the successful control of *Peronospora tabacina* by ferric dimethyl dithiocarbamate ('fermate') has already been noticed from another source [*R.A.M.*, xxi, p. 506].

CLAYTON (E. E.). **Fungicidal value of the salicylates.**—*Science*, N.S., xcvi, 2494, p. 366, 1942.

The problem of finding substitutes for copper fungicides, particularly for the control of the downy mildews, is becoming increasingly important. In fungicide tests conducted over a period of ten years by the Bureau of Plant Industry, United States Department of Agriculture, in co-operation with the experiment stations of Georgia, South and North Carolina, and Maryland, the best control of tobacco downy mildew [*Peronospora tabacina*: see preceding abstract] was obtained with bismuth subsalicylate used at the rate of 1½ lb. plus 1 lb. of vatsol O.T.C. (sodium dioctyl sulphosuccinate) [*R.A.M.*, xix, p. 374] in 100 gals. water. This spray adhered very well to tobacco leaves and was superior to the regular copper oxide-oil in controlling the disease, in causing no plant injury, and in giving better residual protection after spraying was discontinued. Copper oxide-oil was much superior to Bordeaux mixture. Second-best results were obtained with benzyl salicylate (¼ lb. dissolved in 1 gal. cottonseed or soy-bean oil, emulsified and diluted to 100 gals.), but occasionally this spray caused growth retardation in treated plants and did not give quite such a good residual protection. Salicylic acid and zinc salicylate at the rate of ½ lb. dissolved in 1 gal. oil, emulsified and diluted to 100 gals., were found to give effective control, but tended to cause plant injury. Promising results were obtained with butoxyethyl salicylate, dinitrosalicylic acid, and salicyl salicylic acid, all at the rate of ½ lb. in oil. Most of the salicylates do not appear to be critical materials, but difficulties regarding availability and price may be expected.

MAGEE (C. J.), MORGAN (W. L.), & JOHNSTON (A. N.). **Control of spotted wilt of Tomatoes.**—*J. Aust. Inst. agric. Sci.*, viii, 3, pp. 115–117, 1942.

During the past 15 years, spotted wilt has become the most destructive disease of tomatoes in the urban areas of the New South Wales coastal district [*R.A.M.*, xv, p. 538; xxi, pp. 244, 309]. The condition has also caused important losses in inland areas in some seasons. The plants become affected in the seed-bed, after setting out, and in various stages of early and late maturity. Glasshouse crops are not, as a rule, seriously affected.

In a test made at Hawkesbury Agricultural College, Richmond, in an area where incidence had been high the year before, a number of plots of Potentate tomatoes were sprayed with tartar emetic bait to kill the vectors *Thrips tabaci* and *Frankliniella insularis*. Spraying was begun soon after the seedlings appeared above the ground, and was repeated twice every week until planting out. Field applications were made once or twice a week and were repeated after rain. The solution used in the seed beds was 1 oz. tartar emetic, 4 oz. brown sugar, and 4 gals. water, while after planting out the amount of tartar emetic was doubled.

The average infection was 9, 12, and 27 per cent. for the plots treated twice a week, once a week, and not treated, respectively. It is concluded that the method is effective and if tartar emetic could be procured at a reasonable price would doubtless prove commercially profitable. In areas in which the expected incidence amounted to over 20 per cent., spraying once a week would probably be well repaid, while in the seed-bed the treatment would be worth while even with a lower incidence of infection. A suitable strength would, perhaps, be 1 oz. tartar emetic for 4 gals. of water.

Andrus (C. F.), Reynard (G. B.), & Wade (B. L.). **Relative resistance of Tomato varieties, selections, and crosses to defoliation by Alternaria and Stemphylium.**—*Circ. U.S. Dep. Agric.* 652, 23 pp., 4 figs., 2 graphs, 1942.

A tabulated account is given of the preliminary results of a comprehensive breeding programme initiated at the United States Regional Vegetable Breeding Laboratory, Charleston, South Carolina, and aimed at the development of tomatoes resistant to defoliation diseases, commencing with early blight (*Alternaria solani*) and grey leaf spot (*Stemphylium solani*). The technique of artificial infection, involving the preparation of inoculum with a mechanical liquefier, has already been described [*R.A.M.*, xx, p. 546]. Up to the time of writing, some 200 introductions and varieties out of over 1,000 available have been tested under controlled conditions. All proved to be susceptible to *A. solani* when the infection level was kept sufficiently high, and dilution of the inoculum to a reasonable degree resulted in an accession of tolerance among selections of the currant tomato (*Lycopersicum pimpinellifolium*) and *L. peruvianum*, and to a lesser extent in certain commercial varieties of *L. esculentum*, e.g., King George, Danish Extra Early, Devon Surprize, and some sister lines of Pan America. The Targinnie Red variety, reputed to be resistant to defoliation in the field, showed a barely significant degree of tolerance in these trials, apart from a few individual plant selections, but the absence of severe stem infection may be worthy of note.

Outstanding resistance to *S. solani* occurred among selections of *L. pimpinellifolium* especially P(lant) I(ndustry) 79532 and hybrids of this species × *L. esculentum*, many of the former being likewise resistant to *Fusarium* [*bulbigenum* var. *lycopersici*] and some significantly tolerant of early blight. In the hybrid progenies tested, however, no significant correlations could be discerned between resistance to *S. solani* and a similar reaction to *A. solani*.

Although none of the resistant segregates obtained from crosses of *L. pimpinellifolium* × large-fruited *L. esculentum* bore fruits equal to the latter in size, many were intermediate and represented a definite advance towards the commercial type.

Andrus (C. F.), Reynard (G. B.), Jorgensen (H.), & Eades (J.). **Collar rot resistance in Tomatoes.**—*J. agric. Res.*, lxv, 7, pp. 339–346, 2 figs., 1942.

A tabulated survey is given of the collar-rot ratings of a large number of tomato varieties and clonal selections inoculated with aqueous suspensions of macerated *Alternaria solani* cultures by the technique already described [see preceding abstract], which produced 100 per cent. infection on the most susceptible varieties. Among the most resistant were Semperfructifera, P(lant) I(ntroduction) 118787, P.I. 117228, Erste Ernte, King George and a selection from the same variety, P.I. 119105, Targinnie Red Selection, Tomato No. 73, P.I. 127467, Danish Extra Early and a selection, Devon Surprize, Soleil Levant, Ailsa Craig, Cherry, P.I. 120273, *Lycopersicum pimpinellifolium* × Marglobe (F5), Targinnie Red and a selection, Danish Export, P.I. 126913, P.I. 118789, P.I. 138628, Norduke, Riverside, Cereza, P.I. 134208, and Lucullus, all of which were rated at 75 and upwards, implying that the collar lesions were very shallow or showed a definite tendency to heal.

Resistance to collar rot is correlated with a reduced degree of susceptibility to defoliation by the same pathogen. Considerable evidence was forthcoming that many desirable varieties are heterogeneous and segregating for collar rot resistance, so that selection among these might quickly yield desirable resistant strains. It is suggested, for example, that the varieties Norduke, Prairiana, and Riverside might be raised to a highly resistant level by clonal selection and even now these varieties might be substituted for the highly susceptible ones at present preferred. The breeding of resistant varieties by crossing between collar rot-resistant and the most popular but susceptible varieties appears quite practicable.

Sartory (A.) & Meyer (J.). **Le parasite du Noyer Gnomonia leptostyla (Ces. & De Not.) Klebahn et son cycle évolutif.** [The Walnut parasite *Gnomonia leptostyla* (Ces. & De Not.) Klebahn and its developmental cycle.]—*C. R. Acad. Sci., Paris*, ccxii, 13, pp. 567–569, 1941. [Abs. in *Biol. Abstr.*, xvi, 8, p. 1894, 1942.]

The perithecia of *Gnomonia leptostyla*, the agent of walnut anthracnose [*R.A.M.*, xviii, p. 354], are formed in the cortical parenchyma of *Mercurialis perennis*. The ascospores infected walnut leaves in inoculation experiments, and established the genetic connexion between the imperfect (*Marssonia* [*Marssonina*] *juglandis*) and reproductive stages of the pathogen.

Parkin (G.). **Fungi associated with typical truewood decays observed in Victorian forest trees.**—*Aust. For.*, vi, 2, pp. 82–86, 1942.

In 1938, a general survey of the decay occurring in mountain ash [*Eucalyptus regnans*] forests in Victoria was made by L. D. Refshauge (*Vict. For.*, ii, 3, 1938). In the following year, the ash belt was largely devastated by fire, and subsequent investigations were carried out mainly in the burnt areas. A tabulated account is given of the fungi responsible for the decay of 11 specimens of *E. regnans*, two each of *E. viminalis* and *Pinus radiata*, and one each of *E. capitellata*, *E. obliqua*, *Nothofagus cunninghamii*, *Acacia dealbata*, *Banksia integrifolia*, *Cassinia aculeata*, and *Olearia argophylla*, from which it appears that different organisms may produce similar effects on various hosts, e.g., a white, spongy rot was found to be due to *Trametes ochroleuca* in *B. integrifolia* and to *Irpex obliqua* in *E. regnans*. Another fungus causing a white, spongy rot of *E. regnans* was a species of *Poria* (? *Polyporus semi-supinus*), with hyaline hyphae and clamp-connexions measuring 1·5 to 4 and 6 μ, respectively, while *P. caesius* was responsible for a white, stringy rot. *Fomes rimosus* caused a yellowish, spongy rot of *E. regnans*, with a brown discoloration of the outer wood, while the same host was infected by a species of *Poria* (V), with light brown, knobby hyphae, 2 to 4 μ in diameter, and clamp-connexions 3 to 4 μ, which induced a brown, spongy rot (small, white pockets only in the comparatively sound parts), by *P.* (?) *medulla-panis* (brown, cubical rot), and by *Ganoderma applanatum*. *Polyporus* (?) *semi-supinus*, in addition to the above-mentioned white, spongy rot on a branch of *E. regnans*, was found to be the agent of a white pocket rot on a fallen log. Spongy rots of *E. viminalis* were caused by *Hexagonia gunnii* and *F. robustus* (the latter white with brown mycelial pockets); *Stereum illudens* imparted to the outer wood of *N. cunninghamii* a striped, powdery aspect; an orange, spongy rot of *A. dealbata* was traced to *T. cinnabarina*, *Polystictus versicolor* was shown to be the agent of a white, spongy decay of the centre of *C. aculeata*, with black zone lines in the outer part; *I. zonatus* produced a soft, white spongy rot of *O. argophylla*. *Poria* sp. III (? *P. macrospora*, with hyphae 1 to 4 μ and clamp-connexions 3 to 4 μ) caused a stringy to spongy, powdery decay of an *E. obliqua* pole; and the decay of a door architrave made from *Pinus radiata* wood was shown to be due to *P. ferruginosa*.

Weddell (D. J.). **Damage to Catalpa due to recreational use.**—*J. For.*, xl, 10, p. 807, 1 fig., 1942.

The large cankers on the trunks, 4 to 5 ft. above the ground, of *Catalpa bignonioides* trees in a 23-year-old plantation in an arboretum at the University of Georgia were found to be due to *Hypoxylon rubiginosum*, following injuries inflicted by fishermen in the course of collecting the larvae of *Ceratomia catalpae* for bait.

Grosjean (J.). **Het parasitaire Karakter van eenige Polyporaceeën.** [The parasitic character of certain Polyporaceae.]—Thesis, Univ. Amsterdam, 96 pp., 1942. [Abs. in *Z. PflKrankh.*, lii, 9–10, p. 464, 1942.]

Field and laboratory experiments on living trees and cut branches, respectively, indicated that certain Polyporaceae, commonly inhabiting old tree trunks, act as

true parasites, though their progress is very slow and infection occurs only when the oldest annual rings are inoculated, depending for its success, moreover, on the nature of the substratum, wood being superior to bread in the laboratory tests. An isolate of *Fomes igniarius* from *Amelanchier vulgaris* gave positive results on oak (*Quercus pendunculata*), poplar (*Populus alba*), and alder (*Alnus incana*), one from birch (*Betula verrucosa*) on alder (*A. glutinosa*); a strain of *F. laricis* attacked Douglas fir (*Pseudotsuga douglasii* [*P. taxifolia*]), and an isolate of *F. pomaceus* was pathogenic to bird cherry (*Prunus avium*).

STARR (G. H.). **The control of chlorosis in Cottonwood trees and other plants.**—*Bull. Wyo. agric. Exp. Sta.*, 252, 16 pp., 5 figs., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 5, p. 692, 1942.]

Cottonwood [*Populus* (?) *deltoides*] and other trees in the Laramie district and elsewhere in Wyoming are stated to sustain severe damage from a form of chlorosis associated with iron deficiency and curable by the direct application of ferric salts, preferably by the injection of ferric phosphate into holes in the tree. Of 113 trees treated by this method in 1938, only 27 were found to require a further application at the end of the 1941 season. Other ferric salts, especially ferric citrate,were also used for the same purpose with satisfactory results. Injections of ferrous salts were ineffectual, but a solution of ferrous sulphate (copperas) in spray form corrected the chlorotic condition of herbaceous plants, shrubs, and small trees.

BANERJEE (S.) & GHOSH (T.). **Preliminary report on the occurrence of higher fungi on Bamboos in and about Calcutta.**—*Sci. & Cult.*, viii, 4, p. 194, 1942.

Of the 31 higher fungi collected on bamboo (one of the most valuable forest products of India) in and around Calcutta during the last 15 years, seven occurred on the living plant, viz., *Polyporus durus, P. friabilis, Ganoderma lucidum, Amauroderma rugosum, Trametes persoonii, Merulius similis* (apparently restricted to this one host), and *Stereum percome*. The dead wood used for fencing harboured, besides the above-named and other species, *Schizophyllum commune, Irpex flavus, Guepinia spathularia*, and *Daedalea flavida* (hexagonal form).

MCINTYRE (H. L.). **White Pine blister rust control policies in New York State.**—*J. For.*, xl, 10, pp. 782–785, 1942.

Following a survey of the measures adopted in New York State for the control of white pine blister rust [*Cronartium ribicola*: *R.A.M.*, xi, p. 486] since its discovery on cultivated black currant leaves in 1906, the writer refers to the studies recently conducted by W. H. Snell on the importance of red and white currants in connexion with the eradication programme [ibid., xxi, p. 533]. In view of the data so far collected, the destruction of these bushes on a 900-ft. zone round white pine has been discontinued, the maximum radius now covered being about 300 ft. In young plantings or natural stands (12 to 20 years old) growing adjacent to woodlands or swamps, on 128 of which, comprising 170,860 trees, the incidence of infection averaged 10 per cent. in 1938–9, a 50-ft. instead of 900-ft. protective zone is now deemed to be sufficient on the strength of evidence accumulated by E. W. Littlefield (Department of Conservation).

Blister rust control in Washington State.—*J. For.*, xl, 10, pp. 806–807, 1942.

Since 1935, Work Projects Administration employees have been engaged in white pine blister rust [*Cronartium ribicola*] control in the Clearwater, St. Joe, Cœur d'Alene, Kanisku, and Mt. Spokane forests, Washington, the number of men available for this purpose reaching a maximum of 5,700 in 1936 and falling to 300 in 1941. During the period covered by the operations, 110,500,000 trees have been eradicated over 600,000 acres, but the large acreage remaining to be cleared (800,000 acres) has necessitated the expansion of the campaign under a new project calling for the joint support of

the W.P.A. and the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, the former body to provide funds totalling $23,053 and the latter a contribution of $6,981.

JOY (E. L.). **Recent developments in White-Pine blister rust control in the Northwest.**—*Northw. Sci., Wash.*, xvi, 3, pp. 55–58, 1942.

This is a review of the organization and application of the white pine blister rust [*Cronartium ribicola*] control programme in the Pacific Northwest [see preceding abstract], which falls into three periods, viz., (1) 1923 to 1932, occupied by the development of working methods, (2) 1933 to 1936, marked by outstanding progress, and (3) 1937 to 1941, identified with the difficult problem of holding gains previously made with a greatly reduced supply of labour. During the first of the three periods, initial operations were conducted on 215,169 acres (8 per cent. of the total 2,670,000 acres under white pine) and re-working on 6,570 acres, representing only a fraction of 1 per cent., the corresponding acreages covered from 1933 to 1936 (under the Federal emergency unemployment relief scheme) being 1,405,867 acres (52 per cent.) and 70,426 acres (5 per cent.), respectively, and from 1937 to 1941, 252,100 and 323,100 acres, respectively. Important developments in the three principal methods of *Ribes* eradication, namely, hand-grubbing, chemical treatment, and clearance with bulldozers [*R.A.M.*, xviii, p. 359] are described and their present status discussed.

RODGER (G. J.). **South Australia. Woods and Forests Department. Annual Report for the year ended 30th June, 1941.**—12 pp., 1942.

In the section of the report dealing with forest protection (pp. 5–6), a dying of *Pinus radiata* tops at Mount Crawford, which is under investigation by the Waite Research Institute, Adelaide, is stated to be tentatively attributed to a local soil-drought condition, the same factor being held responsible for a widespread yellowing, browning, and ultimate death of the seedlings. A fungus resembling *Diplodia pinea* caused losses among *P. pinaster* seedlings at Mount Gambier, while *Jacaranda* plants at Belair were attacked by *Botrytis cinerea*.

LUDBROOK (W. V.). **The effect of various concentrations of boron on the growth of Pine seedlings in water culture.**—*J. Aust. Inst. agric. Sci.*, viii, 3, pp. 112–114, 1942.

The growth rate of *Pinus radiata* seedlings in water culture [*R.A.M.*, xx, p. 40] increased with increase in the boron concentration of the nutrient solution up to 0·05 p.p.m. of added boron. Conspicuous boron deficiency symptoms appeared in seedlings grown in a nutrient solution containing 0·005 p.p.m. of added boron, and very slight symptoms in one containing 0·01 p.p.m. They were not observed when seedlings were grown in solutions containing 0·05 or more p.p.m. Boron toxicity symptoms developed in older seedlings grown in solutions containing 10 or more p.p.m. of added boron, but not in those containing 5 p.p.m. or less. 'Fused' needles occurred sporadically in boron-deficient cultures, but it was not possible to produce them at will by withholding boron, and it became evident that the field symptoms of needle fusion are not due to boron deficiency.

EKSTRAND (H.). **Förgiftning av växter genom ett fluorhaltigt träimpregneringsmedel.** [Toxicity to plants of a fluorine-containing wood preservative.]—*Medd. Växtskyddsanst., Stockh.*, 36, 32 pp., 6 figs., 1941. [German summary.]

In a nursery-garden near Stockholm severe injury was observed in 1936–7 on lily of the valley and *Begonia* in a greenhouse caused by the fumes of fluralsil [*R.A.M.*, xxi, p. 277], a zinc- and fluorine-containing disinfectant used on the woodwork. The toxic action was found to arise in part through the direct absorption of the preservative by the roots of the plants and partly from the effects of the gaseous

fluorine compounds (silicofluoride or hydrofluosilicic acid) produced by the dissolution by fluralsil of the acids in the wood. Heavy damage was experimentally induced by the fluorine gases [cf. ibid., xxi, p. 151], not only on the above-mentioned plants, but also on *Asparagus sprengeri*, *Cyclamen*, and *Solanum capsicastrum*, *Hydrangea* and tomato being less susceptible. It is evident from these investigations that fluralsil or other fluorine-containing antiseptics are unsuitable for use in greenhouses and on benches.

Treschow (C.). **Zur Kultur von Trametes auf sterilisiertem Waldhumus.** [On the culture of *Trametes* on sterilized forest soil.]—*Zbl. Bakt.*, Abt. 2, civ, 8–10, pp. 186–188, 1941.

In experiments at the Royal Veterinary and Agricultural College, Copenhagen, *Trametes radiciperda* (*Fomes annosus*) failed to grow on acid (P_H 4·2) forest humus from a 70-year-old spruce stand in the natural state, but developed satisfactorily on the same medium subjected to pasteurization or sterilization. No growth was made on autoclaved soil inoculated with *Trichoderma* sp., but the introduction of *Bacillus subtilis* or *Actinomyces* sp. into the substratum did not impede the vigorous development of *F. annosus*. Presumably the inability of the latter to grow on the natural humus is a result of its weakness as a competitor with other fungi.

Barghoorn (E. S.). **The occurrence and significance of marine cellulose-destroying fungi.**—*Science*, N.S., xcvi, 2494, pp. 358–359, 1942.

This is a preliminary note (a detailed account is being prepared for publication in collaboration with Dr. D. H. Linder) on a number of fungi (Pyrenomycetes and Fungi imperfecti), isolated by the author from wood blocks submerged for six to ten months in the sea or from decaying piling in various Massachusetts harbours. These cellulose-destroying aquatic fungi, which are stated to be of considerable economic importance in the destruction of cordage and wood exposed to marine conditions, were found to be of very common occurrence along the North Atlantic Coast with the present known range from Newfoundland to New York Harbour.

Schulze (B.) & Theden (Gerda). **Das Eindringen aufgestrichener Holzschutzmittel in Kiefernsplintholz.** [The penetration of wood-preservative coats into Pine sapwood.]—*Holz Roh-u.-Werkstoff*, v, 7, pp. 239–247, 12 figs., 1 diag., 1 graph, 1942.

At the National Material Testing Station, Dahlem, Berlin, the writers carried out a series of experiments to determine the principles underlying the penetration of oily and watery preservatives into pine sapwood and their practical application in the protective treatment of wood.

The medullary rays were found to act as channels for the passage of both types of liquid from the surface to the interior, the intercellular spaces of the parenchyma providing ingress to the deeper xylem layers and the longitudinal fibres being reached by way of the pits. The narrow lumina of the summer wood absorb most of the preservative substance, the wider spaces of the spring wood being usually, though not invariably, empty. At this stage the movement of the oily liquids is brought to a standstill, whereas those of a watery consistency may, in the presence of sufficient moisture, saturate the cell walls and diffuse further along them; if the wood is dry, on the other hand, it withdraws water from the solution and thus arrests its further progress.

Measurements of the penetration depth of oily and watery protective coatings into pine sapwood of varying moisture contents yielded the following results. As long as the moisture content does not exceed the fibre saturation point, it does not affect the depth of penetration of carbolineum, but once this mark is over-stepped and the lumina are full of water, the inward movement of oleaginous protectives is partially or wholly

impeded. The depth of penetration is proportional to the quantity of oil used, amounting to approximately 3, 4·5, 6, and 8 mm. for 0·625, 1·25, 1·875, and 2·5 gm., respectively, regardless of whether the treatment is carried out at one time or six-hour or three-day intervals. In the case of watery solutions, the depth of penetration increases *pari passu* with rising humidity. Very dry (including air-dry) wood is more deeply penetrated by dilute than by concentrated solutions, whereas the latter percolate more freely through damp wood. As with oil coatings, the depth of penetration of salts is proportional to the quantity applied, but an interruption of the treatment leads to quite different results from those observed with the oleaginous preservatives. Once the first coat of a salt preparation is dry, a subsequent application does not extend the depth of penetration but merely induces an accumulation of the disinfectant in the zone involved.

NIETHAMMER (ANNELIESE). **Wachstumsmöglichkeiten mikroskopischer Pilze auf Sulfitzellulose and Holzschliff sowie Sulfitablauge.** [The growth potentialities of microscopic fungi on sulphite cellulose and mechanical wood pulp, as well as on sulphite spent lye.]—*Holz Roh-u.-Werkstoff*, v, 8, pp. 269–273, 4 figs., 1942.

A comprehensive account is given of the writer's studies at the German Technical College, Prague, Czechoslovakia, on the growth of moulds on sulphite cellulose, mechanical wood pulp, and sulphite spent lye. The moulds were isolated in pure culture on the synthetic medium of Stapp and Bortels [*R.A.M.*, xxi, p. 514] from three sources, viz., (a) seeds and fruits, (b) soil samples, and (c) sulphite cellulose and pulp.

The organisms developing on sulphite cellulose and/or wood pulp fall into four groups, viz., (1) characterized by profuse superficial growth without perceptible penetration into the fibres, e.g., *Mucor silvaticus*, *Thielavia* [*Thielaviopsis*] *basicola*, *Penicillium glaber*, *P. notatum*, *P. expansum*, *P. luteum*, *P. purpurogenum*, and *Stysanus stemonites* from pulp and cellulose; (2) species making little superficial growth but adhering firmly to the substratum, which is clearly permeated though not visibly disorganized, e.g., *Trichoderma koningi* (widespread on all the materials examined), *Fusarium* spp., and *Cladosporium herbarum*; (3) species making copious aerial growth besides infiltrating into the substratum without, however, causing perceptible softening, i.e., *Aspergillus niger* and *A. glaucus*, both of rare occurrence in the material under observation, being isolated once from pulp and developing only at 30° to 32° C.; (4) species of slow but vigorous growth, at first primarily aerial but later invading and definitely softening the substratum, e.g., *Dematium* [*Pullularia*] *pullulans*, which gradually converts portions of both cellulose and pulp strips into a black, soft, slimy mass; *Synsporium biguttatum*, isolated from cellulose and rapidly transforming the strips into a soft mass; and *D.* (*Endomycopsis*) *albicans*, from the same sample of cellulose as the foregoing.

Mixed cultures of various species of moulds generally caused more extensive deterioration of cellulose and pulp than one alone, particularly fruitful in this respect being the co-operation between *Penicillium luteum* and *T. koningi* or *Pullularia pullulans*, *T. koningi* and a species of *Fusarium*, and *F. orthoceras* and *P. pullulans*.

In contrast to the luxuriant growth made by the moulds on cellulose and pulp, development on the spent lyes of sulphite cellulose, diluted with two-thirds of tap water, was poor, a noteworthy feature being the accumulation of oil and fat indicative of degeneration.

HASKELL (R. J.) & DOOLITTLE (S. P.). **Vegetable seed treatments.**—*Fmrs' Bull. U.S. Dep. Agric.* 1862, 17 pp., 4 figs., 1942.

This is a revision of the bulletin of the same number published in 1940 [*R.A.M.*, xxi, p. 112], embodying the results of the most recent researches on the application

of vegetable seed, root, and tuber treatments for the control of fungal and bacterial diseases.

CALDWELL (J.) & PRENTICE (I. W.). **A mosaic disease of Broccoli.**—*Ann. appl. Biol.*, xxix, iv, pp. 366–373, 1 pl., 1942.

A mosaic disease of broccoli, believed to be identical with the cauliflower mosaic described by Tompkins from California [*R.A.M.*, xvii, p. 6], is reported from Devon and Cornwall, where it has been observed every year since 1936. The disease is stated to be widespread and in some seasons very serious, affecting as many as 75 per cent. of the plants in a field or even rendering a whole crop unmarketable. The symptoms, which vary with environment and probably the variety of broccoli, consist in vein-clearing followed by veinbanding and necrotic spotting. Occasionally the leaves appear more or less uniformly mottled. Masking of symptoms is common, and is favoured by warm weather. The disease was readily transmitted to healthy plants by juice inoculation (using carborundum powder) and by the vector *Brevicoryne brassicae*, which is also mainly responsible for the spread of the disease under natural conditions. All of the 20 commercial varieties of broccoli and seven of cauliflower tested were found to be highly susceptible to the virus. The host range of the virus includes Brussels sprouts, cabbage, colewort (*Brassica oleracea* var. *capitata*), kale, savoys, sprouting broccoli, kohlrabi, rape, swede turnip, radish, and charlock. In experiments with the vector, apterous insects became infected after 40 minutes' feeding on a diseased plant, such infective aphids transmitting the virus in a feeding period of 20 minutes. Negative results were obtained in small-scale trials with alate insects. The virus is inactivated by heating for 10 minutes at 80° C. but not at 75°, by storing at 22° for eight days but not for seven, and by dilution to 1: 3,000 but not by one to 1: 2,000. The infection of seedlings in the spring might arise either from the broccoli crop of the previous year or from some intermediate host, such as swede, or from hedgerow weeds.

CALDWELL (J.) & PRENTICE (I. W.). **The spread and effect of Broccoli mosaic in the field.**—*Ann. appl. Biol.*, xxix, iv, pp. 374–379, 1 pl., 1 diag., 1942.

Field observations on the spread of broccoli mosaic [see preceding abstract] carried out from 1938 to 1941 on two Devonshire farms showed that infection spreads rapidly from primarily infected plants, e.g., those probably already infected in the seed-bed before transplanting, to healthy ones. Examination of seed-beds, which are usually placed alongside a hedge, suggested that the seedlings contract infection from diseased hedgerow weeds. When the seed-bed was placed as far as possible from the hedge, primary infections were reduced from about 30 to under 1 per cent. Spraying of seedlings with nicotine soap solution had little effect in checking severe infestation of aphids, as it merely cleared the way for more insects from neighbouring hedgerows. The disease appeared to weaken the ability of the plant to resist frost, probably because the diseased plants usually shed their leaves after frosting, leaving the curds unprotected. Early roguing is recommended for the control of early infections, which are particularly dangerous because they serve as foci of infection.

MOURASHKINSKY (K. E.). Борьба с болезнями Сахарной Свеклы в восточных районах. [Control of diseases of Sugar Beet in the eastern districts.]—*Ex* К весеннему севу **1942** года. Сборник статей. [On the occasion of spring sowing in 1942. Collection of papers.], pp. 64–65, Издат. Наркомзема СССР [Publ. Off. People's Comm. Agric. U.S.S.R.], Omsk, 1942.

Diseases of sugar beet are stated to have been studied very little hitherto in Siberia [where large-scale cultivation of the crop dates from 1932 in the Altaian and only from 1942 in the Omsk and other districts of western Siberia]. The only disease records available are occasional notes made by workers of the Byisk [Altaian district] and of

the Phytopathological Laboratory of the Omsk Agricultural Institute. On the basis of these notes, the author considers that blackleg [*Phoma betae* and other fungi: cf. seedling root rot in western Siberia—*R.A.M.*, xvii, p. 368], *Cercospora beticola* [ibid., xx, p. 332], and mosaic [ibid., xvii, p. 440] may be expected to occur throughout western Siberia. It is believed that *C. beticola* may prove even more destructive than in European Russia; so may *Rhizoctonia* [ibid., xix, p. 322] disease which is very prevalent on the old-established crops such as carrots. Of the two rare but destructive diseases: downy mildew [*Peronospora schachtii*: ibid., xx, p. 333] and rust [*Uromyces betae*: loc. cit.], the former alone is expected to acquire significance and that only on the northern boundary of the beet-cultivation area, while powdery mildew [*Erysiphe polygoni*: ibid., viii, p. 6] is likely to be more dangerous on its southern boundary. The differences in the climatic conditions between the European and the Siberian beet-cultivation areas of the Soviet Union do not suggest the possibility of new diseases developing in Siberia, but it is believed that disease development in general will prove to be more destructive under Siberian conditions.

Esmarch (F.). **Der Wurzelbrand der Rüben.** [Root rot of Beets].—*Kranke Pflanze*, xix, 3–4, pp. 19–23, 1 fig., 1942.

A semi-popular account is given of beet damping-off caused by *Phoma betae*, *Pythium de Baryanum*, *Aphanomyces levis*, *Alternaria tenuis* [*R.A.M.*, xx, p. 440], and *Macrosporium cladosporioides* [ibid., xix, p. 319], the two last-named having only recently been recognized to play a part in the etiology of the disease in Germany, where they appear to be so far restricted to sugar beets. *Phoma betae* is the predominant species among the three first-named pathogens, *Pythium de Baryanum* ranking second in order of frequency and *Aphanomyces levis* third, the ratio being roughly 7 : 4 : 2. The agents of damping-off thrive on heavy, waterlogged, and acid soils, and are further favoured by cold, damp weather at sowing time and during emergence, as well as by insufficient manuring and general neglect of the stands. In addition to cultural measures directed towards the provision of ventilation, dryness, and light, seed treatment with an officially approved fungicide would appear from recent experiments to be of definite, if limited, value [loc. cit.]. According to Pichler (*Nachr-Bl. dtsch PflSchDienst*, xxi, p. 50, 1941), the cost of disinfection is offset by an increase in yield of only 25 kg. per ha.

Watson (M[arion] A.). **Sugar-Beet yellows virus. A preliminary account of experiments and observations on its effect in the field.**—*Ann. appl. Biol.*, xxix, 4, pp. 358–365, 2 pl., 1942.

The yellows disease of sugar beet [*R.A.M.*, xix, p. 637] is believed to be underestimated as a potential danger to sugar production in Britain. In a study of the disease carried out during 1940 and 1941 at Rothamsted, experimental beets infected early in the year (June and July) showed severe stunting and necrosis, those infected in August only slight stunting and less necrosis, and those infected in and after September no stunting or necrosis and only localized symptoms. In the field, the typical yellows symptoms probably result from August or early September infections, later ones, though common, having apparently little effect upon the growth of the plants. Diagnosis of yellows is stated to be difficult owing to the variability of symptoms. Thus, the chlorotic areas on leaves vary from pale, water- or greenish-yellow to rich orange or even red; the chlorotic pattern may start anywhere on the leaf, remaining interveinal in some cases and spreading over the veins in others. The chlorotic areas are either waxy or dry and brittle. Necrosis, apical or marginal, follows the chlorosis down the leaf, sometimes overtaking the chlorotic symptoms before they have time to develop. If this happens when the virus has attacked only the tips and margins of the leaves, the symptoms might be mistaken for potash deficiency. Atypical

symptoms, such as green but stunted and leathery, or even brittle leaves, develop not uncommonly under abnormal weather conditions.

The infected plants in the field occur either in patches of varying size or are distributed all over the field singly or in groups of two or three. The patchy type of distribution is believed to be due to infestation by winged aphids (*Aphis fabae* and *Myzus persicae* were used as experimental vectors) early in the season, when few viruliferous individuals are present causing few small foci of infection round which several more plants become infected later following aphis multiplication; whereas the second, scattered, type is probably due to infestation later in the season when there is a higher proportion of viruliferous insects.

The yields of roots and sugar were found to be considerably reduced by virus infection. Thus, early infection of late-sown beet caused a loss of 67 per cent. of the root, and 71 per cent. of the sugar yield, the loss decreasing with later infection and earlier sowing. The main source of infection is stated to be the seed crop, which often contains a high percentage of virus-infected plants from which the aphids carry the virus to the root crop. The infestation by *A. fabae* occurs comparatively late in the season and is chiefly performed by walking aphids, although the winged aphids produced late in the year probably infect the 'steckling' beds and thus carry over the infection to the next year. The intensity of virus infection depends not so much on the number of insects invading a field, but on the proportion of viruliferous individuals among them and on the proximity of the field to the source of infection, as the vectors lose their infectivity through prolonged fasting. Moreover it depends on subsequent aphid multiplication which is favoured by adverse growing conditions. The factors encouraging early and rapid spread of yellows comprise late sowing, poor cultural conditions, and proximity of the seed crops to the root crops. It is suggested that the growing of seed in the large root-growing districts should be discontinued and that early and intense aphid infestation should be at once brought under control by spraying or fumigation.

Gram (E.). **Mosaiksyge i Runkelroer, Sukkerroer og andre Beder.** [Mosaic disease of Fodder, Sugar, and other Beets.]—*Tidsskr. Planteavl*, xlvi, pp. 686–703, 6 figs., 1942. [English summary.]

Fodder, sugar, and red beets and spinach in Denmark are subject to a mosaic attributed to *Beta* virus 2 [beet mosaic virus], to which *B. maritima* also reacted positively in aphid transmission experiments. In the seed-producing districts where the disorder is prevalent, up to 100 per cent. infection may occur in some seasons, causing losses of 30 and 50 per cent., respectively, in the fodder beet and seed yields. The extent of the disease depends on the amount of aphid infestation, the incubation period ranging from 8 to 16 days and the symptoms varying greatly. The virus overwinters in beets stored for seed production, and may be acquired by aphids feeding on the sprouted plants in the spring. The mechanical spread of the infective principle in the course of harvesting operations is without practical significance, and transmission through the seed or soil has not been observed. Diseased plants can usually be sorted out in the autumn from the lots intended for seed production, and the loss of seed may be considerably reduced by early planting, liberal manuring, and favourable weather conditions. The timely control of aphids effectively prevents new infection. Fodder beets suffer more severely than the sugar-yielding sorts from the mosaic virus, which is of no importance on garden beets and *B. maritima*. No indication of varietal resistance has been obtained.

Larson (A. O.) & Hallock (H. C.). **Time of planting susceptible Beans in relation to curly top injury in south-central Idaho.**—*J. econ. Ent.*, xxxv, 4, pp. 565–569, 3 figs., 1942.

A tabulated account is given of the writers' experiments from 1936 to 1939,

inclusive, to determine the relation between planting time and curly-top development in susceptible bean [*Phaseolus vulgaris*] varieties in south-central Idaho [*R.A.M.*, xx, p. 555], from which it appears that severe infection seldom occurs in stands sown just before or at the start of the spring migration of the beet leafhopper (*Eutettix tenellus*) in the Twin Falls district and the immediately eastward area (average date over a 13-year period 27th May). The cultivation of garden varieties, susceptible Great Northern, or Pinto beans in the western regions of the area under observation is attended by a very high degree of risk at any planting date, but early sowing offers some prospect of a reduction of curly-top losses.

Braun (A. E.). **Resistance of Watermelon to the wilt disease.** *Amer. J. Bot.*, xxix, 8, pp. 683-684, 1942.

To ascertain whether differences in susceptibility to *Fusarium oxysporum* f. *niveum* [*F. bulbigenum* var. *niveum*: *R.A.M.*, xxi, p. 362] among watermelon varieties might be due to the relative amount of some chemical compound present, studies were conducted on the very susceptible variety Kleckley Sweet and the less susceptible Citron. Plants were grown in the field, harvested when six weeks old, dried at 60° C. and ground to pulp, stems and roots being kept separate. Aqueous extracts of the dried pulp were added to liquid culture media inoculated with spores of the fungus. After two weeks the medium with the Citron shoot extract contained considerably less growth than the control. No differences from the control were observed in the cultures with the Citron root extract or the Kleckley Sweet shoot or root extracts. Material extracted with ether from dried pulp had no effect on the growth of the fungus. It thus became apparent that the water-soluble extract contained a substance bearing some relation to susceptibility. This substance, present in a higher proportion in the less susceptible Citron than in the more susceptible Kleckley Sweet, was ascertained to be acetic acid, not necessarily present in the free state. The evidence obtained indicated that fungal growth in Citron is retarded by some material from the shoot, which may be acetic acid, and not from the root, the pathogen establishing itself in the roots of both varieties.

One part of acetic acid in 100 parts of nutrient solution completely inhibited the growth of the fungus, while at 1 in 500 it slightly retarded growth.

Wilhelm (A. F.). **Untersuchungen zur Frage der Kupfersparnis bei Reben (-Plasmopara viticola Berl. et De Toni).** [Investigations on the problem of copper economy in Vines (*Plasmopara viticola* Berl. & De Toni).] *Wein u. Rebe*, xxii, 3, pp. 49-70; 4, pp. 87-96; 5, pp. 111-119, 1940. [Abs. in *Biol. Abstr.*, xvi, 8, pp. 1897-1898, 1942.]

In connexion with the copper economy campaign in Germany, the writer states that aluminium compounds are unsuitable for the replacement of the former element in the treatment of vine downy mildew (*Plasmopara viticola*) [*R.A.M.*, xxi, p. 439], while the value of Martini brown depends on its copper content. One satisfactory method of reducing copper consumption consists in the addition to sulphur lime sprays, themselves of only limited efficacy, of small quantities of copper, and another effective fungicide is composed of 0·25 per cent. Bordeaux brown plus copper sulphate, magnesium sulphate, and calcium oxide. Bordeaux brown is more resistant to washing off by rain than copper oxychloride, with which the use of an adhesive is indicated.

Sixteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1941-42.—33 pp., 1942.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*,

xxi, p. 2]. *Sphaerella linorum*, the agent of 'pasmo' disease of flax, is common throughout the Dominion on the introduced weed *Linum marginale*.

Beta virus 2 [beet mosaic virus] was transmitted from beet [loc. cit.] to all the silver and red beet varieties obtainable in New Zealand, as well as to sugar beet and spinach.

Nearly 90 per cent. of late-spot infections on Sturmer apples were found to be due to *Neofabraea malicorticis* [see below, p. 140]. Weak summer Bordeaux sprays caused injury to this variety in the Hawke's Bay district, where their use should accordingly be discontinued. Colloidal sulphur alone produced fruit of superior quality and did not injure the foliage. At Appleby a reduction in the incidence of Bordeaux injury was effected by increasing the proportion of lime in the mixture.

Bacterium [*Xanthomonas*] *pruni* was isolated from plum trees at Hawke's Bay, and was also found to be responsible for a fairly severe shot hole of peaches in Auckland.

A combination of boron and potash, preferably with an admixture of nitrogen and phosphates, effectively combated foliar chlorosis of vines and internal browning of the grapes in the Braeburn area.

At the Riwaka Tobacco Research Station heavy applications of manure tended to increase the amount of mosaic infection of tobacco plants from seedling beds, while certain fertilizers [unspecified] also induced an extension of the disease in the field. No significant influence on the development of mosaic was exerted by the use of soils of different textures for seed-beds or by the pulling or disking-in of the previous crop prior to planting.

Botany.—*Rep. Ga Exp. Sta., 1941–42*, pp. 68–75, 1942.

This report [cf. *R.A.M.*, xxi, p. 126] contains, *inter alia*, the following items of phytopathological interest. A species of *Guignardia*, suspected to be distinct from the usual agent of grape black rot [*G. bidwellii*: ibid., xxi, p. 318], is responsible for severe damage to certain muscadine [*Vitis rotundifolia*] varieties, e.g., Stuckey and Irene. The leaves and canes are the main objects of attack, but an extension to the fruit pedicels may involve shelling-off of the berries. In contrast to the lengthy period of ascospore discharge (20 weeks) by *G. bidwellii* on bunch grapes, the corresponding duration in the muscadine species is only about two months. Of the three species of *Phoma* isolated from rotted muscadine berries, only one has so far been found capable of attacking uninjured fruits. *Melanconium fuligineum* [loc. cit.] is the most common occupant of decaying muscadine berries, besides being prevalent on bunch grapes. The fungus readily invades wounded berries, but all attempts to infect uninjured fruits with it have been unsuccessful.

During 1941, black root [ibid., xx, p. 620] was responsible for 40 per cent. of the recorded mortality among beans [*Phaseolus vulgaris*] at Experiment, the corresponding figures for root rots (*Fusarium* and *Rhizoctonia* spp.) and for ashy stem blight (*Macrophomina phaseoli*) and southern blight (*Sclerotium rolfsii*) together being 36 and under 5 per cent., respectively. At Tifton *M. phaseoli* caused 60 and *F.* and *R.* spp. together 25 per cent. of the bean deaths. Ashy stem blight was found to represent the more advanced phase of the disease caused by *M. phaseoli*, which is associated with the production of pycnidia by the fungus, the infection of seedlings and young succulent stems by the hyphae and black sclerotia (*S. bataticola*) being known as charcoal rot. Seeds from pods bearing the pycnidia of *M. phaseoli*, if they germinate at all, almost invariably give rise to diseased (charcoal-rotted) seedlings. The decayed areas resulting from seed-borne inoculum extend from the cotyledons downwards, whereas those arising from infection through the soil may originate either at the cotyledons or soil-level. Seed-borne transmission of *M. phaseoli* is expected to be an important factor in the Coastal Plain where local seed is used. Cross-inoculation experiments with cultures of *M. phaseoli* on sterilized oats kernels from beans, cowpeas, lupins, partridge peas [? *Cassia* spp.], *Lespedeza*, and clover, which were macroscopically and microscopically

identical and produced no pycnidia gave uniformly positive results, whereas an externally similar isolate from cotton was non-pathogenic to beans and the other plants and vice versa.

Among the strains of watermelons developed in a breeding programme S 87, a superior Stone Mountain type, has proved outstanding in respect of resistance to wilt [*F. bulbigenum* var. *tracheiphilum*] in three years' trials on heavily infested soil. Of the foreign strains tested for resistance to the same pathogen, *Citrullus colocynthis* was better able to withstand infection than any of the indigenous varieties, but the elimination of its bitter flavour and poor quality by back-crossing to watermelon is likely to be difficult.

Two out of ten selections from the hybrid of a commercial tomato and *L[ycopersicum] pimpinellifolium* tested for resistance to wilt (*F.[b.* var. *lycopersici*]) in comparison with 23 local lines gave highly satisfactory results, one being also free from nematodes, which caused severe damage to the other, as well as to the home-bred strains; 95 per cent. of the latter were dead when the final counts were made on 4th November. Further selections from the hybrids, combining immunity from wilt and nematodes with resistance to *Septoria* [*lycopersici*], are being crossed with some of the best large fruited local strains.

The two chief vetch diseases are root rot, caused by several fungi, and false anthracnose (*Protocoronospora nigricans*), which is responsible for extensive defoliation in wet seasons, the common (smooth) and hairy (*Vicia villosa*) varieties mostly grown commercially being fairly resistant to the former but susceptible to the latter disorder.

Two widespread leaf spots are very destructive to cowpeas, namely, *Cercospora cruenta* and *Amerosporium oeconomicum*, the New Era variety being particularly susceptible to the former.

Elrod (R. P.). **The Erwinia-coliform relationship.** *J. Bact.*, xliv, 4, pp. 433–440, 1942.

A tabulated account is given of the writer's comparative studies at the Rockefeller Institute for Medical Research, Princeton, New Jersey, on 19 strains of *Erwinia*, including *E. solanisapra*, *E. carotovora*, *E. aroideae*, and *E. carotovora*, and 50 representative forms of *Escherichia coli* [cf. *R.A.M.*, xxi, p. 325].

The manner in which the *Erwinia* isolates fermented lactose suggested their classification as aberrant coliforms, the majority approximating, on the basis of their IMViC (indole-methyl red, Voges-Proskauer, citrate) patterns, to *Escherichia freundii*. On the other hand, their gelatine-liquefying capacity, motility, and production of acid in glycerol, denotes a closer relationship with *Aerobacter cloacae*. Sixteen of the *Erwinia* cultures on nutrient broth were pathogenic to carrot or turnip, or both, five being unable to attack the former host, while three were innocuous to the latter. None of the coliform organisms produced any degree of maceration in the vegetable tissues. All but two of the *Erwinia* strains, and 22 out of 50 of the coliform group fermented pectin in a synthetic medium. No correlation was apparent between the ability to disorganize plant tissues and pectin fermentation. The possession of the former character would appear to confirm the validity of a separation between *Erwinia* and the coliforms, though the close relationship between the two groups must be recognized.

Breed (R. S.) & Conn (H. J.). **Bacterial generic names as common nouns.** *Science*, N.S., xcvi, 2500, pp. 493–494, 1942.

The authors take exception to the usage by bacteriologists of generic names in the plural as common nouns when, as for instance, in the sentence 'none of the rhizobia are able to grow in this medium except *Rhizobium meliloti*', the mistake is made of using 'rhizobia' for 'species' of the genus *Rhizobium* instead of 'individuals' or 'specimens' of this genus. The authors do not oppose the use of such words as 'bacteria', 'bacilli', 'micrococci', or 'streptococci' as long as they stand for individuals and not species.

Ignatieff (V. P.) & Efremenkova (Mme E. V.) **Serological examination of plants affected with bacteriosis. III. Examination of legumes for B. medicaginis v. phaseolicola, B. flaccumfaciens, B. phaseoli v. fuscans and others.** Микробиол.] [*Microbiol.*, v. 4, pp. 429–437, 1941. [English summary. Abs. in *Biol. Abstr.*, xvi, 10, pp. 2339–2340, 1942.]

Extracts of bean [*Phaseolus vulgaris*] plants infected by *B*[*acterium*: *Xanthomonas*] *medicaginis* var. *phaseolicola*, *Burk.* [*Corynebacterium*] *flaccumfaciens*, or *Burk.* [*X.*] *phaseoli* var. *fuscans* gave specific precipitin reactions with sera prepared against the corresponding organism. The best extracts were obtained from finely cut portions of plants kept in water heated to 60° C., clarification being effected by one filtration (preferably not more) through talc. Extracts prepared from healthy seeds yielded non-specific precipitates, which could be eliminated by first treating the extracts with normal serum for two hours at 37° to 40°, followed by a day in the refrigerator, the resultant precipitate being centrifuged off and the clear liquid used for testing. Extracts of infected seeds thus treated gave specific precipitin reactions with the antisera to the species of bacteria causing infection. Dialysis of the seed extracts for 24 hours in a collodion bag against running water also removed the non-specific precipitates. The residue of sediment left in the bag was clarified by centrifugation, after which only the appropriate specific reactions were obtained.

Dubos (R. J.) **Microbiology.** *Ann. Rev. Biochem.*, xi, pp. 659–678, 1942.

Included in this review and discussion of some outstanding recent contributions (listed in a bibliography of 162 titles) to the knowledge of bacteriostatic and bactericidal substances are a number relating to the inhibition of bacterial growth by Actinomycetes and moulds, notably species of *Trichoderma*, *Gliocladium*, and *Penicillium*, reference to which has been made from time to time in this *Review*.

Barker (R. E. D.) & Crowdy (S. H.) **Witches' broom disease investigations. II. Notes on the susceptibility of I. C. S. selections at River Estate to witches' broom disease of Cacao.** *Trop. Agriculture, Trin.*, xix, 11, pp. 207–209, 1942.

In further investigations into the witches' broom disease of cacao in Trinidad [*Marasmius perniciosus*: *R.A.M.*, xx, p. 453], two-, three-, and four-year-old I. C. S. clones were under observation for susceptibility from 1940 to 1942 at River Estate, where the disease has been severe in recent years. The susceptibility was assessed either by removing and counting all brooms at the end of each month or by removing all brooms in December, and making a single count during March. This second method, based on the observation that 80 per cent. of the annual total of brooms was produced in the three months from January to March, gave as good results as the method of monthly countings. None of the clones was found to be immune or even highly resistant, but data obtained indicate that clones 1, 6, 8, 9, 22, and 93 are worth further trials. It is pointed out, however, that only young trees were tested, no account being taken of mature tree or of pod resistance.

Dixon Weston (W. A. R.) **Seed disinfection of Barley and Oats.** *J. Minist. Agric., Lond.*, xlix, 3, pp. 157–160, 2 figs., 1942.

The author describes in semi-popular terms the symptoms of oats and barley stripe (*Helminthosporium avenae* and *H. gramineum*, respectively), and gives recommendations for their control by dusting the seed grain with one of the approved organic mercurial dressings now on the market [*R.A.M.*, xv, p. 667]. In recent experiments (with R. E. Taylor) at the Cambridge University Farm, six proprietary preparations of this type were tested for the control of *H. gramineum* in a sample of barley seed-grain harbouring 93 per cent. natural infection. The incidence of stripe in the plots treated with the mercurial dressings amounted to only 0·4 per cent. of diseased seedlings, as

against 34 and 29 per cent. in those left untreated or given a formalin sprinkle, respectively.

Straib (W.). **Über die Interferenzwirkung von Luftfeuchtigkeit und Temperatur auf das Zustandekommen der Infektion mit Uredosporen verschiedener Getreideroststarten.** [On the interferential effect of atmospheric humidity and temperature on the occurrence of infection by the uredospores of various cereal rust species.] — *Z. PflKrankh.*, l, 11, pp. 529-552, 1940. [Abs. in *Biol. Abstr.*, xvi, 10, pp. 2344-2345, 1942.]

Puccinia glumarum, the agent of yellow rust of wheat, was the only cereal rust among those studied at the Brunswick branch of the Biological Institute in which the several physiologic races showed clear-cut differences in their responses to the relative effects of temperature and incubation period in a saturated atmosphere on uredospore germination and on the initiation of infection by these spores [*R.A.M.*, xxi, p. 440]. The optimum temperature for the germination of *P. glumarum* was below 10° C., for *P. graminis* and *P. coronata* above 20°, and for *P. triticina*, *P. dispersa* [*P. secalina*], and *P. simplex* [*P. anomala*] slightly below this point. For most of the races of *P. glumarum* the maximum germination temperature was 25°, though in some cases 28° was reached, the corresponding degree for the other rusts being 31.5° to 32°. The temperature ranges for spore germination in *P. triticina*, *P. coronata*, *P. graminis* and *P. glumarum* were 5° to 25°, 3° to 25°, 8° to 25°, and 9° to 11°, respectively, the minimum for all species being 1° to 2°, except for *P. coronata*, in which it was 3° to 4°. At the optimum temperature the spores of *P. glumarum* require one to two hours longer for germination than those of the other species under observation. The period needed by *P. glumarum* for the production of full infection in a saturated atmosphere was shorter than in any of the other rusts. At 8° to 10°, the initiation of infection by the uredospores of *P. coronata* and *P. graminis* was much delayed although their germination was about as rapid at the lower temperature as at 20°. It is concluded that the temperature and humidity relations determine the sequence of development of the different rusts, which in Germany opens with *P. glumarum* and closes with *P. coronata* and *P. graminis*, outbreaks of *P. anomala*, *P. dispersa*, and *P. triticina* falling in the intervening period. In other countries, where the overwintering factor assumes major importance, the order of occurrence may be different.

Clark (F. E.). **Experiments toward the control of take-all disease of Wheat and the Phymatotrichum root rot of Cotton.** — *Tech. Bull. U.S. Dep. Agric.* 835, 27 pp., 3 figs., 1 graph, 1942.

Fertility and soil sanitation contributions of different organic manures to soils infested by wheat take-all (*Ophiobolus graminis*), as revealed by nitrate nitrogen and available phosphorus contents, microbial counts, and incidence of infection on the host, were studied in greenhouse experiments [*R.A.M.*, xxi, p. 445]. Organic materials giving satisfactory control of the disease, e.g., chicken manure and lucerne tops, markedly increased both the nitrate nitrogen and available phosphorus contents of the soil. In a comparative test with partially composted and fresh manures, only the latter proved effective against *O. graminis*, the nitrate nitrogen disappearing from the former about the time of the onset of the disease. When naturally infested soil, in which wheat had been successfully cultivated under an appropriate fertilizing scheme, was re-cropped to the same host under conditions favouring the parasite, the failure of manurial treatment to eliminate the latter became apparent. On the other hand, the fungus was eradicated from naturally infested soil maintained for three months under moisture and temperature conditions promoting microbial activity but totally devoid of susceptible roots.

Uncontaminated, viable sclerotia of *Phymatotrichum omnivorum*, the agent of cotton root rot, survived as well in sterile, organic amended, as in sterile, untreated

soil, suggesting that the destruction of these organs is effected by the saprophytic microflora [ibid., xxi, p. 137]. Widely differing types of organic material, including (besides those already enumerated [loc. cit.]) starch, cellulose, ground wheat straw, ground lucerne hay, crimson clover and hairy vetch tops, and commercial peptone, were successfully used at rates of 0·5 to 5 per cent. for the extermination of the sclerotia from both Hunt clay and Wilson loam soils given either the high- or low-nitrogen type of amendment: the incidence of elimination from washed sand was slightly poorer. In tests to determine the influence of the incubation temperature and soil moisture on the efficacy of the organic substances against *P. omnivorum*, 12, 30, 72, and 91 per cent., respectively, of the viable sclerotia were destroyed at 2°, 12°, 28°, and 35° C., respectively, and 59·5, 66·2, and 76·7 per cent., respectively, at 35, 58, and 80 per cent. of the moisture-holding capacity of amended Hunt clay, the corresponding percentages for unamended soil being 37, 38, and 33.

Cutting healthy cotton roots below the crown was found to hasten their colonization by saprophytic fungi, no such effect following the infliction of injuries above the crown. From plants parasitized by *P. omnivorum* but not mechanically injured, *Penicillium* and *Trichoderma* spp., Dematiaceae, and sterile mycelia were encountered with greater, and *Aspergillus* spp. and Mucorales with less, relative frequency on root segments incubated in the moist chamber. About two-thirds of all the root segments recovered from healthy, unwounded plants were free from saprophytic fungi, which developed, however, on four-fifths of those clipped below the crown; at the same time, this practice contributed to the rapid disappearance of the root-rot organism from its host.

Fischer (G. J.) & Noll (W.). **Marchitamiento de Avena provocado por Corticium rolfsii.** [Rot of Oats caused by *Corticium rolfsii*.]—*Rev. argent. Agron.*, ix, 3, pp. 244–248, 1942.

Corticium rolfsii (Sacc.) Curzi was isolated in pure culture on malt agar at 20° to 25° C. from plants of *Avena byzantina* at the Phytotechnical Institute, La Estanzuela, Uruguay, which were observed during March, 1942, to be suffering from dry rot, manifested by a dark yellow, soil-coloured tinge and ultimately by the entire disappearance of the upper parts of the plants under the influence of rain. The roots were found to be covered with strands of the whitish mycelium and chestnut-coloured sclerotia of the imperfect stage of the fungus (*Sclerotium rolfsii*), the basidial (perfect) phase having been subsequently identified in cultures by L. Grodsinsky of the Argentine Ministry of Agriculture. In controlled soil (damp sand) inoculation experiments at 28°, 24°, and 12° to 18°, the incidence of infection reached a maximum at the highest temperature, with only two healthy plants out of the 14 germinating, the corresponding figures for the medium and low temperatures being 19 out of 99 and 78 out of 94, respectively. This is believed to be the first record of *C. rolfsii* on *A. byzantina*.

Sherman (G. D.), McHargue (J. S.), & Hodgkiss (W. S.). **The production of a lime-induced manganese deficiency on an eroded Kentucky soil.**—*J. Amer. Soc. Agron.*, xxxiv, 12, pp. 1076–1083, 1 fig., 1942.

Wolverine oats grown in jars containing badly eroded acid subsoil from Adair County, Kentucky, with a very low active manganese content developed typical grey speck symptoms [*R.A.M.*, xxi, p. 522] on the addition of lime (calcium carbonate) at a rate equivalent to 8,000 lb. per acre. Better growth was obtained by the simultaneous application to the soil of lime and either manganese or copper sulphate or both (at 100 and 50 lb. per acre, respectively), the average yields (in gm. per jar) for the controls and the lime, lime plus manganese sulphate, lime plus copper sulphate, and all three compounds being 64·7, 34·4, 101·5, 97·8, and 93·1, respectively. In comparable tests on a high-manganese soil from Larne County, the growth of the plants was

favourably influenced by the lime treatment, the addition to which of the above-mentioned compounds did not significantly affect the field.

Leukel (R. W.). **Chloropicrin as a disinfectant for plant beds.**—*Phytopathology*, xxxii, 11, pp. 1034–1036, 1 fig., 1942.

The writer reports excellent control of *Pythium arrhenomanes* on Colby milo sorghum by the application to the soil of outdoor plant beds of chloropicrin at the rate of 3 c.c. per sq. ft., using a special contrivance to introduce the chemical at a depth of 6 in. [*R.A.M.*, xxi, p. 423]. The treatment was made on 12th May, 1941, the soil being covered with a tarpaulin for four days, and the seed sown on the 29th. At midsummer the plants in the treated beds were vigorous and sound, producing luxuriant heads, whereas those in the control plots were stunted and dying, with unfilled heads. *P. arrhenomanes* was isolated from the crowns and roots of the infected plants.

Color handbook of Citrus diseases.—*Calif. Citrogr.*, xxvii, 3, p. 73, 1942.

The 'Color handbook of Citrus diseases' (90 pp., Calif. Univ. Pr., $3.50) by L. J. Klotz and H. S. Fawcett comprises detailed descriptions of 76 maladies of the crop, with special reference to their control and a reduction of orchard, packing-house, and transit disorders. The work is illustrated by 40 plates, containing 108 full-colour photographs and is designed to meet the needs both of commercial industry and scientific research.

Fawcett (H. S.) & Klotz (L. J.). **Septoria spot of Citrus fruits.**—*Calif. Citrogr.*, xxvi, 1, p. 2, 1 fig., 1940.

Spotting of Valencia orange, lemon, and grapefruit, due to *Septoria citri* and *S. limonum*, is stated to be prevalent in the inland citrus-growing regions of California [*R.A.M.*, xxi, p. 73]. The pale tan or buff, sunken spots, with greenish to reddish-brown borders, mostly do not exceed 1 to 2 mm. in diameter or penetrate below the flavedo, but some of the larger, dark brown lesions may attain a diameter of 4 to 6 or even 10 mm. and extend into the albedo. Some of the spots contain the pycnidia of the fungi, usually in association with the causal organism of anthracnose [*Colletotrichum gloeosporioides*]. In laboratory tests spore germination in *S.* spp. was completely inhibited by 41 hours' exposure to zinc-lime whitewash (5–33–100), zinc-copper-lime whitewash (5–2–33–100 or 10–1–5–100) and Bordeaux mixture (3–2¼–100 or 1–¾–100). For orchard practice the writers advocate an autumn application of 1–¾–100 Bordeaux mixture. In localities such as Tulare county, where a whitewash consisting of 25 lb. lime to 100 gals. water is used, 1 to 2 lb. copper sulphate should be added per 100 gals. The addition of zinc, where required against mottle leaf, is likewise helpful in the control of *Septoria* spots at the rate of 5 lb. per 100 gals.

Klotz (L. J.). **Brown rot of Citrus fruit. Important factors in its control in orchard and packing house.**—*Calif. Citrogr.*, xxvii, 1, pp. 6, 23, 1 fig., 1941.

The following recommendations are given for the control of citrus brown rot [chiefly *Phytophthora citrophthora* and *P. parasitica*: *R.A.M.*, xx, p. 571] in California, based on the results of experiments to determine the factors involved in the failure of the standard methods of prevention during the excessively rainy season of 1941. In orchards where cyanide fumigation is practised, Bordeaux mixture 1–1–100 should be applied to the lower 4 ft. of foliage and fruit just before or after the first autumn rain. For the simultaneous control of mottle leaf a spray containing 5 lb. zinc sulphate, 1 lb. copper sulphate, and 4 lb. hydrated lime should be applied to the whole tree. Where cyanide fumigation is not carried out, a more concentrated Bordeaux formula (6–6–100) should be employed. All fruit and foliage should be covered where exanthema (copper deficiency) is present or the grove is subject to frequent wind-driven rains. In very wet seasons, an additional treatment may be given at the end of

January or early in February, while a further precautionary measure consists in spraying the tree trunk and ground beneath.

In the packing-house there are several important factors to be considered in connexion with the occasional decrease in efficacy of the hot water, hot soda ash (1¼ per cent.), or hot soda ash-soap (½ per cent.) immersion treatment. It was shown, for instance, that the protective action of two minutes' immersion in a soda ash-soap solution at 72° F. tends to be lost if infection took place more than 1½ hours prior to the dip, the fruit (Eureka lemons in the silver stage) being kept in the meantime at 73° to promote rapid spore germination. With an increasing lapse of time between infection and immersion the potency of the treatment gradually declines until after three hours the incidence of decay ranged from 80 to 90 per cent. While the cold solution kills all the brown rot spores on the surface of the fruit with which it comes into contact, it is probably quite ineffectual once the germ-tubes have penetrated the rind; at 70° the fungus reached a depth of 0·024 in. in 24 hours. At a temperature of 117° to 120° the above-mentioned solution protected the lemons from brown rot, even when infection occurred 24 hours previously, but a gradual loss of efficacy then followed until after 36 hours 95 per cent. of the fruit became rotten. In another series of experiments, lemons in the dark green stage, inoculated 24, 34, and 48 hours previously, were immersed in water heated to 119° for periods ranging from 12 seconds to four minutes, followed by five seconds' sprinkling with cool hydrant water. The minimum duration of treatment permitted 35 per cent. decay in the fruit inoculated 24 hours earlier, and 70 per cent. in that left for the two longer periods between infection and immersion. Treatments maintained for two minutes and upwards afforded complete protection to the lemons inoculated 34 hours earlier, while 80 per cent. remained sound even after a dip lasting one minute only.

Fawcett (H. S.) & Klotz (L. J.). **Prevention of brown rot. Proper planting will help avoid a large amount of brown rot gummosis.**—*Calif. Citrogr.*, xxvii, 6, p. 56, 1942.

Brown rot gummosis (*Phytophthora parasitica* and *P. citrophthora*) [see preceding abstract] may begin in the nursery, and the tap- and lateral roots of susceptible stocks should be examined before planting, so that any tree showing cankers or dying-back may be discarded. The 'bare-root' planting system is advocated wherever climatic and other conditions are sufficiently favourable, since it permits of a thorough inspection of the state of the rootstock, but success by this method demands great care. Unduly deep planting should be avoided, the trees being placed at a height (allowing for settling) fully equal to, or slightly in excess of, that obtaining in the nursery. The first main lateral roots should not be more than 1 to 2 in. below the surface of the soil at the trunk. When the trees are planted in ridges, from which the earth may subsequently be partially drawn away to leave the first main lateral roots at the trunk near soil-level, the base of the tree should not be left for any length of time in contact with wet soil. An additional precaution consists in dusting the balls just before planting with 5–1–4 zinc-copper-lime or dipping them in 2–2–100 Bordeaux mixture. The former preparation or equal parts of finely ground copper sulphate and hydrated lime should also be applied in the form of a paste or dust just after planting, and prior to subsequent irrigations if necessary, to the base for 6 to 8 in. above soil-level and down to the first main lateral roots, while in locations subject to heavy infection 2–2–100 Bordeaux mixture may be poured in or sprayed at the base of the young tree after pulling back the burlap from the top of the ball, as a further precaution against an attack on the tap-root.

Greig (A. M. W). **Preventing infection in Citrus fruit.**—*Orchard. N. Z.*, xv, 6, p. 3, 1942.

For the control of citrus brown rot (*Phytophthora citrophthora*) in the Auckland district of New Zealand, the writer recommends the application of an autumn spray

of 3–4–50 Bordeaux mixture, paying special attention to the foliage and stems within 3 to 4 ft. of ground-level and sowing a cover crop under the spread of the branches. Where the latter practice has been omitted and infection has previously assumed an acute form, the trees should be pruned so as to allow a clearance of 3 ft. between the lower branches and the ground, the soil being frequently stirred. Picking-cases, on return from the lemon assembly depots, should be scraped, dipped in 1 in 1,000 shirlan WS, and stacked under cover. The autumn treatment will further assist in the control of verrucosis [*Elsinoe fawcetti*], melanose grey scab [*Diaporthe citri*], wither tip (*Glomerella*) [*cingulata*], and blast [*Pseudomonas syringae*], cultural measures against the last-named of which should also include the provision of adequate shelter and the hardening-off of autumn growth by the omission of nitrogenous manures in a rapidly acting form or excessive quantities.

Fraser (Lilian). **Phytophthora root rot of Citrus.**— *J. Aust. Inst. agric. Sci.*, viii, 3, pp. 101–105, 3 figs., 1942.

Citrus collar rot (*Phytophthora citrophthora*) is stated to be serious and destructive in the coastal areas of New South Wales. It generally starts above the bud union, the almost universally used rough lemon (*Citrus limonia*) stock being resistant to the fungus. The root rot phase of the disease appears to be more prevalent on sweet orange (*C. sinensis*) stock, which is more susceptible than rough lemon. Most of the soils in the coastal areas are sandy and well drained, and water does not remain near the roots for long periods.

In heavier soil types, such as those found in the Parramatta and 'Hills' districts and parts of the alluvial flats along the Hawkesbury River, tree vigour has declined in recent years. The roots of affected trees show small to medium-sized lesions extending to the surface of the wood, and situated mainly on the lower half of the root. These lesions appear on roots of all sizes, but only in the most advanced cases do they extend to the crown roots. The lesions enlarge rapidly for a time, and may then stop growing, owing to a change in environmental conditions; a marginal callus is then formed, but is often broken when decay sets in again. Small roots may form at the margin of the lesions. The development of fibrous feeding roots by such trees is invariably much smaller than is the case in sandy, well-drained soils, and fibrous roots are often discovered in a decayed state, with no compensating production of new roots.

P. citrophthora was first isolated by the author in New South Wales from root lesions in September, 1941, from an orchard in the Murrumbidgee Irrigation Area. Decay was progressing rapidly in soil rendered continuously damp by spray irrigation, and protected from excessive heat by permanent grass. The roots showed lesions ranging in size from the small type characteristic of coastal orchards to a foot rot almost as severe as that found on sweet orange stocks in Florida. Subsequent surveys showed that the fungus was widespread throughout the Murrumbidgee Area, in the heavy soils of the coast, and in some parts of the Murray River area.

Experiments with different stocks in glasshouses demonstrated that under wet conditions *P. citrophthora* rapidly attacked the fibrous feeding roots of susceptible varieties, though no decay occurred in uninoculated soil. Saturated soil conditions were not necessary for root decay, but the rate of progress of the decay was determined by soil moisture, and was very slow in comparatively dry soils. Only when the soil was waterlogged for lengthy periods did decay extend from the fibrous roots to the main laterals. Decay of the fibrous roots occurred 24 to 48 hours after inoculation.

The presence of *P. citrophthora* was demonstrated in a few cases showing initial decay of the fibrous roots in the field. Observations showed that periodic rotting of fibrous roots could occur for some years before the larger roots showed decay; this phase alone sometimes resulted in marked deterioration in the health of the tree, thinning of the canopy, failure to make adequate new growth, poor cropping, and poor

leaf colour. In most instances, lesions on the larger roots result from the spread of infection from fibrous roots and small laterals.

Field and laboratory inoculation experiments showed that of the four citrus varieties used for stock purposes in New South Wales sweet orange is, apparently, the most susceptible, rough lemon rather less so, Seville orange somewhat resistant, and *Poncirus trifoliata* immune.

AVERNA-SACCÁ (R.). **Nectria cancri (Butg.) f. aurantii, Averna.**—*Rev. Agric., Piracicaba*, xvi, 3–4, pp. 150–160, 7 figs., 1941. [Portuguese.]

Two species of *Nectria* cause appreciable damage to citrus in São Paulo, Brazil, viz., *N. cancri* (Butg.) [? misprint for Rutgers] f. *aurantii* Averna on orange and an unidentified species on lemon. The former attacks the vegetative system, including the superficial roots, the stem bases of plants in low-lying, humid sites sustaining particularly severe injury. The infected organs are covered by the delicate white or ashen-grey, cottony or salt-like efflorescence constituted by the conidial (*Fusarium*) stage of the fungus, which ultimately disappears under the influence of cold and damp conditions, to be replaced by a dense, blood-red, granular coating extending over a large part of the invaded area. In some cases the *Nectria* stage is observed on cankers (usually of traumatic origin) on the stem bases.

The *Fusarium* under observation makes good growth on ordinary media, forming cottony, white, later yellow colonies. Sporodochia appear in 12 to 15 days. The falcate, hyaline, tri-, rarely quinqueseptate conidia measure 22 to 37 by 5·5 to 7·4 μ, the thick-walled, round chlamydospores 14 to 18·5 by 14·8 to 22·2 μ, the globular to piriform, cinnabar- or brick-red perithecia, which are covered with uni-, bi-, or tricellular, straight or curved incrustations and furnished with a short, conical, subhyaline, ostiolate beak and hyaline paraphyses, 248 to 648 μ in diameter, the clavate asci 103 to 174 by 18 to 25 μ, and the elliptical, hyaline, thick-walled spores 16 to 28 by 11 to 14·5 μ.

The branches and trunks of lemon trees attacked by the unidentified species of *Nectria* bear ashen-yellow, bright red, or pale brick-coloured pustules of the conidial stage, *Tuberculariа vulgaris* [the conidial stage of *N. cinnabarina*]. The perfect stage is stated to differ, however, from *N. cinnabarina* in its larger ascospores (32 to 37 by 16 to 20 compared with 14 to 16 by 5 to 7 μ).

Treatment against both diseases should comprise disinfection of unavoidable wounds with a paste.

Breeding wilt-resistance.—*Indian Fmg*, iii, 8, pp. 442–443, 1942.

Wilt (*Fusarium vasinfectum*) is stated to be much the most important disease of the Indian cotton crop, occurring as it does throughout the Bombay province (except in North Gujerat), in Berar, the western districts of the Central Provinces, the Nizam's Dominions, Northern Mysore, and in parts of the United Provinces and the Punjab. In Bombay the average annual reduction from this source approximates to 5 per cent., but in certain years the damage may amount to upwards of 50 per cent. Among the well-known resistant selections bred by members of various Agricultural Departments are Jayawant, grown in the Karnatak, Jarila in Khandesh, BD 8 in Broach and Verum 434 [*Gossypium neglectum verum*] [*R.A.M.*, xix, p. 15] in the Central Provinces and Berar. In connexion with the Central Cotton Committee's breeding scheme, a technique for the isolation of 100 per cent. resistant types under optimum conditions in a glass-house equipped with temperature controls has been developed at Poona [ibid., xx, p. 256], the selections thus obtained being subjected to further vigorous greenhouse and field testing before their ultimate release for cultivation. Some of the strains originating in the Broach and Jalgaon cotton-growing tracts now comply with all the requirements for full immunity from wilt and are expected shortly to be available for general distribution in Bombay and the neighbouring States.

Prayag (S. H.). **Karnatak Cotton and its improvement.**—*Indian Fmg*, iii, 9, pp. 488–491, 2 pl., 1942.

The highly popular Jayawant (Triumphant) wilt (*Fusarium vasinfectum*) resistant cotton variety [see preceding abstract] is the offspring of two pure strains of Kumpta, Dharwar 1 and Dharwar 2, and dates from 1928. Its wilt mortality percentage (average of three years) was only 0·7 per cent. compared with 5·7 per Kumpta. Another selection from Kumpta combining a high degree of resistance to wilt with heavy yields and superior staple quality is K.F.T. –12–2–5, which has been developed in connexion with the 100 per cent. resistance scheme and tested with satisfactory results at Dharwar and Poona.

Two segregates of a cross between Gadag 1 (a Dharwar-American type) and Co. 2, viz., 4–4–1–1 and 9–7–6–6, are superior to the former parent in resistance to red leaf blight [*R.A.M.*, xvi, p. 97] and other respects.

Staten (G.). **Cottonseed treatments in New Mexico.**—*Bull. N. Mex. agric. Exp. Sta.* 290, 32 pp., 7 figs., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 5, p. 683, 1942.]

In tests at the New Mexico Agricultural Experiment Station with acid-delinted and undelinted cotton seed, normal dosages of several dusts in common use, including new improved ceresan, 2 per cent. ceresan, and spergon, slightly reduced the germination rate, while an excess of the first-named caused a serious retardation and exerted toxic effects on the seedlings. Dusted seed germinated satisfactorily after over a year's storage. Both the ceresan preparations conferred absolute protection against the rotting of seed, whether delinted or not, in cold soil, spergon being almost equally effective for this purpose, while sanoseed and cuprocide were of relatively little value. Spergon, new improved ceresan, and 2 per cent. ceresan proved to be capable of increasing seedling emergence and survival stands, preventing pre-emergence damping-off, reducing the post-emergence phase of the same trouble in some cases, and augmenting the number of healthy plants in soils infested with *Rhizoctonia* [*Corticium solani*].

Ezekiel (W. N.). **Cotton root rot, the weather, and Cotton yields.**—*Trans. Tex. Acad. Sci.*, xxv (*1941*), pp. 63–68, 1 map, 1942.

Many of the observations included in this survey of the relation of weather conditions to cotton root rot (*Phymatotrichum omnivorum*) and crop yields in Texas have been noticed from other sources [*R.A.M.*, xviii, p. 106 *et passim*], but the author's interpretation of the final picture of the influence of rainfall on the host and parasite may be mentioned. Both respond in somewhat the same manner to this factor. Thus, in years of 'favourable' rainfall comparatively high yields may be obtained even in areas where the disease is prevalent, but the output is very much lower than it would be in the absence of the fungus, the development of which is likewise promoted by continuous humidity. In other words, the root rot tends to equalize yields on the particular farms affected at drought level.

Hardy (E.). **Textile mildews.**—*Silk and Rayon*, xvi, 8, pp. 468, 470, 1 fig., 1942.

Fresh samples of raw cotton are stated to have yielded from 4,000,000 to 58,000,000 bacteria and 120,000 to 400,000 moulds per gm., mostly of the soil types which attack cellulose and starch and survive the textile-manufacturing processes in the form of spores. Cotton deterioration in storage is caused by species of *Stachybotrys*, and raw cotton (especially Indian) is the source of much of this infection of cloth. The first sign of mildew is usually a characteristic musty smell, followed by the appearance of greenish, brownish, reddish, yellowish, purplish, or blackish spots due to the presence of *Penicillium chrysogenum*, *Aspergillus niger*, *A. versicolor*, *A. wentii* [*R.A.M.*, xxii, p. 64], *Fusarium* spp., and *Mucor* spp., respectively. Acidity stains are produced on dyed material by *A. fumigatus*, *A. niger*, *P. chrysogenum*, and *Rhizopus arrhizus*.

Cellulose-decomposing species responsible for tendering of cotton include the foregoing, *A. glaucus*, *A. versicolor*, and *A. terreus*, while *A. brunneofuscus*, *A. clavatus*, and *A. fumigatus* will attack the pure cellulose fibres of cotton under suitable moisture conditions and in the presence of inorganic salts.

Well-washed wool requires an atmospheric humidity of 97 per cent. to encourage mildew, but a far lower concentration permits its growth in the case of an impure commercial product, while cotton is also susceptible, e.g., to *A. glaucus*, at a point much further removed from saturation. Most mildews thrive at 25° '., while *A. fumigatus* continues to grow at 37°. The *Penicillium* and *Mucor* spp. generally flourish at lower temperatures than the *Aspergilli*, and are thus less prevalent on tropical material. Shirlan is stated to be the most efficient antiseptic at present known to the cotton industry. Some of the most effective of the 135 chemical treatments devised by the United States Department of Agriculture for the mildew-proofing of cotton fabrics are a cation (plus charge) active softener, followed by a synthetic resin, methyl methacrylate; acetone, formalin, and soda ash; wax and aluminium acetate; catechu copper sulphate and ammonium hydroxide; copper propionyl acetate; and cadmium chloride followed by borax. Sodium pentachlorphenate (santobrite) is an effective and cheap preventive of mildew, while of recent years successful use has also been made of non-toxic higher tertiary alkyl phenols, e.g. abracide, which inhibited cellulose moulds at 1 in 6,000 and *M. mucedo* and *A. glaucus* at 1 in 4,000, and is supplied in a 5 per cent. solution made up in a 10 per cent. potash castor oil soap solution, used in conjunction with 10 per cent. ethylene glycol.

The chemical changes produced by textile mildews are very far-reaching, *P. glaucum*, for instance, having been shown to secrete at least 12 enzymes which decompose the carbohydrates and proteids of the size and produce organic acids tending, in association with a powerful simultaneous reducing action, to destroy the coloured ground of printed goods. Under optimum conditions during manufacturing *Mucor* moulds may proceed from germination to fructification in 24 hours.

Uphof (J. C. T.). **Ecological relations of plants with ants and termites.** —*Bot. Rev.*, viii, 9, pp. 563–598, 1942.

Among the aspects included in this survey of the ecological relations of plants with ants and termites may be mentioned 'the fungus-growing habit among ants and termites', 'ant-fungi', and 'termite-fungi'. The bibliography of 193 titles comprises a number dealing with the mycological side of the symbiotic connexion between fungi and insects, some of which have already been noticed in this *Review* [*R.A.M.*, xiv, p. 167; xix, p. 405; xx, p. 257].

Drechsler (C.). **Two zoophagous species of Acrostalagmus with multicellular Desmidiospora-like chlamydospores.**—*J. Wash. Acad. Sci.*, xxxii, 11, pp. 343–350, 2 figs., 1942.

In continuation of his researches on predaceous fungi parasitic on eelworms [*R.A.M.*, xxi, p. 488], the author gives full descriptions of two new species of *Acrostalagmus*, namely, *A. gonioides* and *A. tagenophorus*, the former destroying *Bunonema* nematodes in leaf mould at Arlington, Virginia, and the latter preying on rotifers in rich soil in Washington, D.C., and in decaying watercress leaves near Woodstock, Virginia. Both species are characterized by terminal, flat, short-stalked, multicellular, yellowish-brown chlamydospores, 12 to 30 by 6 to 15 μ in *A. gonioides* and 5 to 25 by 2 to 3 μ in *A. tagenophorus*, presenting striking analogies with those described by Thaxter (*Bot. Gaz.*, xvi, pp. 201–205, 1891) as typical of *Desmidiospora myrmecophila*.

Couch (J. N.). **A new fungus on Crab eggs.**—*J. Elisha Mitchell sci. Soc.*, lviii, 2, pp. 158–162, 2 pl., 1942.

A full description, with a technical diagnosis [in English only], is given of *Lagenidium*

callinectes n. sp., a parasite on blue crab eggs (*Callinectes sapidus*) at East Lynnhaven, Virginia. Infection is contracted by means of the zoospores, which germinate on the surface of the egg and send into the interior a germ-tube, the originator of a branched sparsely septate mycelium, eventually almost filling the egg. A sporangium may be formed from each segment of the mycelium. The end of a thread from a segment grows against the egg wall to form a clavate structure from which a fine hypha is pushed through the wall and grows into a large cylindrical tube. The tip of the tube gelatinizes and swells to form a spherical mass into which granular protoplasm flows. Ultimately the vesicle bursts and liberates the zoospores. Spherical resting bodies are formed in old eggs. Attempts to secure pure cultures were unsuccessful. The incidence of infection in the material examined amounted to some 2·5 per cent.

White (R. T.) & Dutky (S. R.). **Co-operative distribution of organisms causing milky disease of Japanese Beetle grubs.** — *J. econ. Ent.*, xxxv, 5, pp. 679–682, 1942.

With a view to the acceleration of the natural spread of the organisms responsible for the milky disease of Japanese beetle (*Popillia japonica*, Newm.) grubs (*Bacillus lentimorbus* and *B. popilliae*) [*R.A.M.*, xxi, p. 78], the Bureau of Entomology and Plant Quarantine has undertaken an extensive colonization programme in co-operation with the appropriate agencies in 11 States and the District of Columbia. At the time of writing (November, 1942), nearly 21,000 acres, comprising 25,593 colony sites, in heavily infested areas had been treated with the disease-producing bacilli, and furthermore, 260 experimental plots, distributed in seven States and the District of Columbia and covering 92 acres, serve as points of local dispersion.

Ferreira (L. A.). **Problemas de micologia médica em Moçambique.** [Problems of medical mycology in Mozambique.] — *Bol. Soc. Estud. Colón. Moçambique*, x, 44, pp. 33–64, 7 figs., 1941.

This is a comprehensive account of the etiology, geographical distribution, mode of infection, pathological anatomy, clinical development, diagnosis, and therapy of sporotrichosis, associated in Mozambique with *Sporotrichum schenckii*. The paper includes keys to the family Sporotricheae and the genus *Sporotrichum* and an explanatory survey of the application of Beijerinck's auxanographic method of identification to the yeasts.

Propionate salts as mould inhibitor. — *Nat. Butt. J.*, xxxiii, 6, p. 16, 1 fig., 1942.

Directions are given for the incorporation of propionate salts [*R.A.M.*, xx, p. 173, *et passim*] in butter and cheese at various stages of processing. For 'dry wrapping', parchment paper impregnated with a sufficient quantity of the disinfectant for mould retardation is supplied by the manufacturers, but for 'wet wrapping', e.g., for lining tubs or print wraps, the parchment should be soaked just before use in a solution containing about 20 oz. of the salt per gal. water. In cream cheese, the fungicide may be added either to the 'cold' or 'hot pack', the concentration recommended being 2½ oz. per 100 lb. for spraying or sprinkling in during mixing of the 'cold pack' or 3 to 6 oz. if the solution is added to the undrained curd before bagging. In the case of the 'hot pack', the best results are obtained by the addition of 2½ oz. of the inhibitor during the last five minutes of cooking. The mould-retardant may be added to cottage cheese at the above-mentioned rate at the same time as regular salt. Cut Cheddar cheese need only be immersed for 15 seconds in a solution of the salts to extend the mould free period from 300 to 400 per cent. — a point of some importance in the light of a large chain grocery's report that losses from this source in cheeses of the Cheddar type range from 8 to 12 per cent. of the total sales.

Skok (J.). **Some mineral deficiency symptoms in plants.**—*Trans. Ill. Acad. Sci.*, xxxiv, 2, pp. 78–81, 1 fig., 1941.

A detailed description, accompanied by statistical data in tabular form, is given of the symptoms induced by deficiencies of nitrogen, calcium, potassium, phosphorus, magnesium, sulphur, boron, and iron in *Petunia hybrida* (Rosy Morn), *Salvia spendens* (Scarlet Dragoon), and *Phlox drummondii* in laboratory experiments at the University of Chicago.

Blanton (F. S.) & Haasis (F. A.). **Insect transmission of the virus causing Narcissus mosaic.**—*J. agric. Res.*, lxv, 9, pp. 413–419, 1942.

When 15 species of insects and two of mites were allowed to feed on mosaic Sir Watkin narcissus [daffodil: *Narcissus pseudonarcissus*] plants [*R.A.M.*, xx, p. 206] and were then transferred to healthy narcissus maintained in cages in the greenhouse and the field, positive results were obtained with all seven species of aphids tested, viz., *Macrosiphum solanifolii* (152 out of 403 plants infected), *M. rosae* (89 out of 136), *M. pisi* (24 out of 31), *Aphis rumicis* (398 out of 605), *Myzus convolvuli* (210 out of 324), *M. cerasi* (15 out of 36), and *Anuraphis roseus* (13 out of 18), control tests with aphids transferred from one healthy plant to another yielding 10 out of 230, 2 out of 54, 14 out of 226, and 9 out of 140 for the first, second, fourth, and fifth species, respectively. *Macrosiphum solanifolii*, *M. pisi*, *Anuraphis roseus*, and *Aphis rumicis* have been collected on narcissus plants growing in the field, but only *M. solanifolii* was able to multiply on these plants.

The aphids transmitted the virus to 904 out of 1,558 plants of the Sir Watkin, King Alfred, Minister Talma, Spring Glory, and Victoria varieties. Symptoms appeared in the season following inoculation, and were characteristic of the disease as found on naturally infected plants of the same variety growing in the field.

Kirchner (H. A.). **Grauschimmel an Gartenwicken-Blüten.** [Grey mould on Sweet Pea flowers.]—*Kranke Pflanze*, xix, 3/4, pp. 33–35, 1 pl., 1942.

For the first time in 1940, and again to a slighter extent in 1941, the writer observed an attack on sweet pea flowers at the Rostock Agricultural Experiment Station by the grey mould (*Botrytis cinerea*), the varieties affected being the lavender-blue Austin Frederick and the salmon Hallmark Pink. The spots produced by the pathogen on the petals were colourless and ring-shaped. Infection did not spread to the pedicels until late in the season. The flowering period in 1940 fell at the end of July and beginning of August, when cool and very showery weather prevailed.

Salikov (M. I.). К экологии гриба **Stachybotrys alternans** „виновника" стахиботриотоксикоза Лошадей. [The ecology of the fungus *Stachybotrys alternans*, responsible for poisoning of Horses.]—*Советская Ветеринария* [*Sovetsk. Vet.*], xvii, 6, pp. 53–56, 2 figs., 1 graph, 1940.

Strachybotrys alternans, which recently caused fodder poisoning in the U.S.S.R. [*R.A.M.*, xxii, p. 65], is favoured by excessive moisture and by temperatures of between 20° and 25° C., although tolerating a range of 5° to 40°. The infection is spread by direct contact and by means of air-borne spores. The infected straw and stubble turn dark grey or almost black, the spores appearing like black soot on the stems. In cases of weak infection the fungus is chiefly localized near the stem nodes. For control of the fungus, it is recommended that straw and hay ricks be made in dry weather and on clean sites, and that fields be kept clear of heaps of weeds or straw and stubble.

Neill (J. C.). **The endophytes of Lolium and Festuca.**—*N.Z.J. Sci. Tech.*, xxiii, A, 4, pp. 185–193, 1941.

Further studies are described in the endophytes and related fungi of grasses in New

Zealand [*R.A.M.*, xix, p. 477]. In culture the endophyte of *Lolium perenne* forms white, later dusky pink, pulvinate, gelatinous-waxy sporodochia 0·5 to 1·5 mm. in diameter, consisting of a central core of branching conidiophores, each about 4·5 μ in diameter, with secondary branches measuring 6 to 18 by 3 to 4 μ and bearing tubular sterigmata measuring 12 to 23 by 2 μ. The hyaline, continuous, smooth, elliptical conidia, which measure 2·3 to 3·2 by 1·5 to 2 μ, are produced in succession by budding from the protoplasm of the sterigmata. After the first conidium has ruptured the apex, the outer membrane of the sterigma remains as an open tube, in which more conidia form and through the orifice of which they are discharged. A mucilage discharged with the conidia binds the whole into the sporodochial form. The whole sporodochium closely agrees with *Endoconidium temulentum* [ibid., xxi, p. 2].

A sparse development of structures that may be macroconidia was observed in culture. They closely resemble the *Sphaceliа* conidia of *Claviceps*, being hyaline, smooth, continuous, cylindrical with hemispherical ends, measure 5 to 8 by 3 to 4 μ, and usually show two refractive globules. As a rule, they occur in small groups budded from short lateral sterigmata measuring 8 to 15 by 2 μ, but they also arise singly as terminal or lateral buds.

Numerous unsuccessful attempts were made to infect endophyte-free *L. perenne*, *L. italicum*, and *L. temulentum* with the fungus from pure culture by direct inoculation. No transmission occurred by contact when six endophyte-free seedlings were grown in boxes between infected plants for nine months. One positive result was, however, obtained, which may be significant: fresh apothecia of *Lolium* fungus No. 2 (Neill and Hyde, 1940) were planted on the host plants on the surface of eight pots of soil. Short lengths of $\frac{1}{2}$ in. pipe led from the drainage holes to the soil surface, and through these were taken three spikes of endophyte-free rye grass just beginning to flower, the whole being covered with a lamp-chimney with double muslin cover. The seed from the three enclosed spikes and that from the remaining spikes was harvested separately and sown in pots of sterilized soil, the resultant seedlings being examined for the presence of the endophyte. From seven of the plants 246 seedlings from the enclosed, and 244 from the check, spikes were examined, and found to be endophyte-free. From the eighth plant, however, 37 seedlings raised from the enclosed spikes yielded two with typical endophytic hyphae, 53 seedlings from the check spikes yielding none. No ergot developed on the enclosed spikes, though most of the check spikes became infected. If *Lolium* fungus No. 2 is the apothecial stage of the endophyte, it is hard to explain the widely different appearance and physiology of the two fungi in culture.

Tall fescue (*Festuca arundinacea*) and meadow fescue (*F. elatior*) in New Zealand normally contain an endophyte which in culture on most media forms a slowly spreading, white, sublanose mat, the surface of which soon breaks into blisters and folds. Conidia appear singly, budded from the apex of short tapering sterigmata, measuring 12 to 25 by 1·5 μ at the base, which branch perpendicularly at intervals from trailing aerial hyphae. Before the conidium matures a drop of mucilage appears at its apex; at maturity, this mucilage appears to assist abstriction by flowing down the lower surface, gumming the conidium at right angles to the apex of the sterigma when abstriction is complete. These conidia are hyaline, continuous, somewhat irregularly elliptical, and measure 6 to 8 by 2 to 3 μ. In dry, old cultures the conidia tend to be curved, with attenuated extremities, and may attain a length of 11 μ. The conidial apparatus is identical with that described for *Epichloe typhina* [ibid., xiv, p. 766], but the conidia are rather larger. If the New Zealand *Festuca* endophyte is a strain of *E. typhina*, it must have permanently lost the ability to produce asci or prevent flowering of the host.

Data from 11 samples of New Zealand tall fescue seed indicated that endophyte-free plants are produced by infected seed if twelve months at least have elapsed since harvest.

Johansson (E.). **Nyare undersökningar på fruktodlingens område.** [Recent investigations in the sphere of fruit cultivation.]—*Sverig. pomol. Fören. Årsskr.*, xlii, pp. 17–32, 1941.

The following items occur in this survey. In August, 1941, apples from the north of Scania showing typical symptoms of internal cork were received at the Swedish State Experimental Nursery, Alnarp. In *Norsk Havetid.*, p. 95, 1941, K. A. Hjeltnes reports that in the spring of 1937 Charlamovsky and Antonovka apple trees suffering from boron deficiency in Norway were supplied with borax at the rate of 0·8 kg. per 100 sq.m. During the harvest of 1939, 600 fruits were examined, half from a treated tree, and the remainder from an untreated: symptoms of boron shortage were apparent in 3 per cent. of the former and in 77 per cent. of the latter.

Tiller (L. W.). **Orchard storage of Apples.** —*Orchard. N.Z.*, xiv, 4, pp. 68–69, 71, 1941.

The consumption within New Zealand of apples normally exported is necessitated by war conditions. Refrigerated space being restricted, the possibilities of orchard storage were investigated. Four types of improvised stores were tested, the coolest and most successful proving to be an excavation in a bank, with a floor of shingle and a roof of straw thatch over wire netting, ventilation being provided.

The Statesman variety kept better in the orchard than in cold storage, and Tasma sustained practically no loss. Damage to Sturmers was chiefly due to wilt, but this was prevented by the use of waxed paper case linings, and much reduced by plain newsprint. Granny Smith and Washington could be stored for only a short time, being very susceptible to ripe rot. Ballarat apples required dry air conditions, and then kept well, but showed better ground colour—an important feature—in cold storage. Dougherty also developed ripe rot in a moist atmosphere, and there was an appreciable amount of slight superficial scald in this variety. Rome Beauty and Rokewood were affected by mealiness and severe breakdown.

Cunningham (G. H.). **Research work on ripe-spot of Apples.**—*Orchard. N.Z.*, xv, 6, p. 2, 1942.

The fungus isolated from 95 per cent. of the cultures from the brown or black, sometimes pink-bordered, sunken spots on different varieties of New Zealand apples was identified as *Neofabraea malicorticis* [*R.A.M.*, xiii, p. 523], inoculation with which into sound fruits resulted in the typical symptoms of ripe rot. Factors tending to increase the development of the disease in storage include late picking, retention in the shed after picking, and unduly high storage temperatures. The results of orchard experiments indicate that a reasonable degree of ripe rot control, without appreciable injury to the foliage or fruits, may be secured by three applications of Bordeaux mixture, (1) at 1-3-100 in early January, (2) at 2-6-100 in mid-February, and (3) as for (1) in the third week of March, ¼ lb. casein and ¼ lb. hydrated lime per 100 gals. spray being added in each case.

Shaw (F. R.) & Bourne (A. I.). **Some observations on the effects of sulphur compounds applied during bloom on Bee behaviour.**—*J. econ. Ent.*, xxxv, 4, pp. 607–608, 1942.

The results of preliminary experiments in Massachusetts indicated that sulphur applied to Arkansas apple blossoms during the flowering period, either in the form of a 400-mesh dust or in that of a 1 in 50 lime-sulphur solution, for the control of scab [*Venturia inaequalis*], reduced the number of bee visits [*R.A.M.*, xvi, p. 188]. Nine trials were conducted between noon and 4 p.m., during which period the average numbers of bee visits to the untreated, sprayed, and dusted blossoms were 197, 95, and 48, respectively, the corresponding averages per test and per minute being 21·8, 10·5, and 5·3, and 2·18, 1·05, and 0·53, respectively. Considering that the rainy conditions

favouring severe scab tend in themselves to depress the activity of the insects, the wisdom of applying repellants to the trees at this juncture is questionable.

POWELL (D.). **How do codling moth sprays affect scab control?**—*Illinois Hort.*, xxxi, 3, pp. 1–3, 1942. [Abs. in *Hort. Abstr.*, xii, 4, p. 197, 1942.]

The effect of codling moth [*Cydia pomonella*] sprays on scab [*Venturia inaequalis*] control on a 20-acre block of Delicious apples was investigated by the Illinois Natural History Survey in 1940–1. The plot receiving five lead arsenate-dilute Bordeaux treatments at intervals from 8th May to 12th June showed 4·5 per cent. infection on 16th September compared with 68 per cent. in the untreated controls. Other spray combinations gave less satisfactory results. In the following spring the percentages of dead leaves bearing perithecia under the trees were 2 for the lead arsenate-Bordeaux spray and 31 for the controls, the figures for infection of green foliage being 4 and 61, respectively. The conclusion is reached that more attention should be paid to scab control in late summer, that the codling moth spray schedules assist in the suppression of the fungus, and that late-season applications greatly facilitate control in the following spring.

ROLFS (F. M.). **Apple blotch.**—*Bull. Okla. agric. Exp. Sta.* B-261, 15 pp., 4 figs., 1942.

This is a semi-popular account of the history, distribution, symptoms, etiology, modes of dissemination among seedling, nursery, and orchard trees, and control of apple blotch (*Phyllosticta solitaria*), specimens of which were first collected by L. M. Underwood on crab apple in Indiana in 1893 (*Proc. Ind. Acad. Sci.*, pp. 144–156, 1894), the earliest record for Oklahoma dating from 1908 (*Bull. Okla. agric. Exp. Sta.* 76) and the present area of infection extending from New Jersey and Georgia to Nebraska and Texas. Under Oklahoma conditions the most susceptible cultivated apple varieties are Arkansas Black, Ben Davis, Cooper's Early, Duchess, Fameuse, Gano, Huntsman, Maiden Blush, Mann, Missouri Pippin, Oliver, Rome Beauty, Roman Stem, Shockley, Smith Cider, Stark, and White Winter Pearmain, a considerable degree of resistance being shown by Delicious, Early Harvest, Grimes Golden, Ingram, Jonathan, Ralls Genet, Red June, Stayman Winesap, Starking, Wealthy Winesap, Yellow Transparent, and York Imperial. Pears are also liable to infection by *P. solitaria*.

Dissemination from old, forgotten trees takes place by means of pycnospores carried by wind and rain, while infected leaves from such trees may also be washed away in the run-off water or blown considerable distances by the wind. The radius of infection for wind-blown raindrops from a tree 30 ft. high is about 240 ft., with 100 per cent. contamination in the first 40 ft. area. The degree of spread diminishes with distance from the tree, but the area involved usually becomes greatly and irregularly extended by infection carried in run-off water and wind-blown leaves. In Oklahoma the sweating process of dealing with seedling trees used as stocks also serves to spread infection. Young trees are lifted in October, placed slanting in bundles in rows in a shallow bed, covered with soil until December, and then lifted ready for grading and packing. The close contact and mixing of the bundles afford ample opportunity for direct infection of stems and roots, especially if the sweating is unduly prolonged.

Control should be based on the stringent exclusion of the pathogen from seedling and nursery material, a planting site at least half-a-mile from any centre of the disease being chosen, supplemented by regular spraying with Bordeaux mixture.

HUELIN (F. E.) & TINDALE (G. B.). **Investigations on the gas storage of Victorian Pears.**—*J. Dep. Agric. Vict.*, xl, 11, pp. 594–606, 3 figs., 2 graphs, 1942.

In further investigations into the storage of pears in Victoria [*R.A.M.*, xvii, p. 468]

carried out from 1938 to 1940, continuous gas storage (at 32° F.) in 5 per cent. carbon dioxide and 16 per cent. oxygen increased the storage life of William's Bon Chrétien, Bosc, and Winter Cole by about 100 per cent., that of Packham and Winter Nelis by about 30 per cent., and that of Josephine pears by less than 10 per cent. Even better results were obtained with a storage atmosphere containing 10 per cent. carbon dioxide and 11 per cent. oxygen, but there was serious risk of damage through hard heart. This new type of wastage (the term 'hard heart' is used in preference to 'brown heart', which may cover any kind of internal discoloration) is characterized by a sharply defined area of hard, probably dead, tissue including the core and extending to some or most of the surrounding flesh, the affected area being sometimes, but not invariably, discoloured. Hard heart was frequently observed in pears stored in atmospheres containing 10 per cent. or more of carbon dioxide, particularly when gas storage was preceded by air storage. Another new disorder, described as a type of lenticel scald and observed mainly in pears placed in gas storage after about six weeks in air, appeared, upon removal of the pears from storage, as somewhat diffuse spots around the lenticels, later extending and merging into lesions similar to those of ordinary scald, but lighter in colour and more blotchy. Continuous gas storage gave better results than gas storage preceded or followed by air storage. Bosc pears kept for three months in air prior to gas storage became liable to injury even in an atmosphere containing only 5 per cent. carbon dioxide, whereas exposure of the same variety to high concentrations of carbon dioxide (20 per cent. falling to 13 per cent.) for about a week caused no injury. A picking of William's Bon Chrétien pears proved much more liable to hard heart in an atmosphere containing 10 per cent. carbon dioxide and 11 per cent. oxygen than one made 10 to 14 days earlier. Gas storage was found to retard colouring of the fruits, the results indicating that the rate of colouring is largely a function of the concentration of oxygen. Pending further trials, it is tentatively suggested that an initial period in 10 per cent. carbon dioxide and 11 per cent. oxygen preceding storage in 5 per cent. carbon dioxide and 16 per cent. oxygen may give the best results.

Hildebrand (E. M.), Berkeley (G. H.), & Cation (D.). **Handbook of virus diseases of stone fruits in North America.**—*Misc. Publ. Mich. agric. Exp. Sta.*, 76 pp., 1942. [Abs. in *Exp. Sta. Rec.*, lxxxvii, 5, p. 691, 1942.]

One of the results of a conference held at the Michigan State College in 1941 to discuss the problem of the stone fruit virus diseases, which have gradually been assuming an acute form in the United States, was the selection of a committee to collect and classify both published and unpublished data on the nomenclature, symptoms, host range, geographical distribution, and other features of this group of disorders. The object of the present handbook is the immediate circulation of an up-to-date summary of the available information on the viruses in question, including some not hitherto reported.

McWhorter (O. T.). **Peach twig blight hits orchards hard.**—*Bett. Fruit*, xxxvii, 4, p. 3, 1942.

Peach orchards in Oregon were severely damaged in 1942 by twig blight [*Clasterosporium carpophilum*] and brown rot [*Sclerotinia laxa* and *S. fructicola*], recommendations for the control of which (likewise effective against curl [*Taphrina deformans*]) in the Willamette Valley during the dormant period include (1) removal before leaf-fall of all dead twigs killed by the fungi to destroy the sources of infection within the tree; (2) thorough spraying, before the onset of the autumn rains, with a 4–4–50 Bordeaux mixture to forestall the activities of *C. carpophilum*; and (3) an anti-leaf curl treatment of 6–6–50 Bordeaux plus 1 pint to 1 quart summer oil before the swelling of the winter buds (in December).

Lyman (C.) & Dean (L. A.). **Zinc deficiency of Pineapples in relation to soil and plant composition.**—*Soil Sci.*, liv, 5, pp. 315–324, 3 figs., 1942.

A tabulated account is given of an investigation to determine the zinc content of pineapple plants and soils in relation to the observed zinc-deficiency symptoms in the field in Hawaii, the procedures used for these purposes being described in detail. The symptoms of zinc deficiency in the plants appear to fall into two phases, of which the more common and less severe is a mottling and blistering of the upper leaf surfaces, occasionally followed by a mild curvature of the unmottled younger leaves. The results showed an evident correlation between the degree of zinc deficiency exhibited by the plants and the zinc content of the soils in which they were grown. The meristematic tissues showed the maximum concentrations of zinc, and provided figures most closely proportionate to the soil zinc content.

It is concluded from these data that the curative effects of zinc sulphate sprays on pineapple plants affected by the anomalies herein described are a direct outcome of the inability of the soil to provide sufficient zinc for normal growth.

Fellers (C. R.) & Clague (J. A.). **Souring of dried Dates by sugar-tolerant yeasts.**—*Fruit Prod. J.*, xxi, 11, pp. 326–327, 347, 2 figs., 1942.

During the past two years the writers examined at the Massachusetts State College about a dozen samples of sour dates, two imported from Algeria and the remainder consisting of the Hallowi, Sayer, and Khadrawi varieties from Iraq, of which the first-named was the most subject to the defect under investigation and the last almost immune. Cultures of the affected material on nutrient cider agar, date syrup, wort agar, and Gorodkowa's spore medium at a temperature range of 20° to 37·5° C. (optimum 30°) yielded five strains of *Torula* and *Willia anomala* [*R.A.M.*, xi, p. 384]. The cells of *T.* strains A, B, and C measured, respectively, 5·2 to 7·8 by 2·6 to 5·2, 7·8 by 5·2 to 7·8, and 5·2 by 5·2 μ, the characters of D and E being similar. All the yeasts were facultative anaerobes; none liquefied gelatine, induced any significant changes in milk or litmus milk, or fermented lactose, glycerine, silicin, or inulin; fat globules were conspicuous in all the cultures. No souring was produced in dates with a moisture content below 25 per cent., 23 per cent. being proposed as a safe maximum for market fruits. All the organisms were totally destroyed by an hour's pasteurization at 160° F. at a relative humidity of 75 per cent.

Mrak (E. M.), Phaff (H. J.), Vaughn (R. H.), & Hansen (H. N.).—**Yeasts occurring in souring Figs.**—*J. Bact.*, xliv, 4, pp. 441–450, 1942.

From 30 samples of three varieties of souring figs (Calimyrna, Adriatic, and Kadota) from various parts of California, 115 yeasts were isolated [cf. preceding abstract], mostly species of *Saccharomyces* and *Candida*, the former including *S. cerevisiae* (25), *S. tubiformis* (6), *S. fragilis* (2), and one each of *S. cerevisiae* var. *ellipsoideus*, *S. carlobergensis* var. *monacensis*, and *S. c.* var. *polymorphus*, and the latter *C. krusei* (26), *C. chalmersi* (6), and an unidentified species of the *guilliermondi* group. Other organisms concerned in the spoilage of the figs included *Pichia kluyveri* (14), *P. fermentans* and *P. belgica* (one each), *Zygospichia chevalieri* (one), *Hanseniaspora melligeri* (8), *Kloeckera lindneri* (12), *K. africana* (one), *Torulopsis stellata* (6), and single isolates of *Zygosaccharomyces globiformis*, *Hansenula anomala* var. *sphaerica*, and *Debaryomyces dekkeri* n.sp., characterized by spherical to globose cells measuring (in one- and three-day liquid wort cultures) 2·4 to 3·6 by 2·4 to 3·6 (average 3 by 3) μ, and spherical, rough ascospores, 2·9 by 2·9 μ, arising from iso- or heterogamic conjugation in 40-day-old cultures. Glucose, fructose, mannose, sucrose, maltose, and ⅓ raffinose are fermented, asparagin, ammonium sulphate, urea, and peptone utilized, and good growth made in alcohol. Slant cultures are pale olive-buff, smooth or slightly verrucose, glistening, and convex with entire borders.

The sugar tolerance of the souring organisms was low, most of them growing in 40°, but not in 50° Balling, fig syrup. Their production of volatile and fixed acids was insufficient to cause the defect under observation, which is attributed to the joint action of the yeasts and bacteria (mostly *Acetobacter*), which were isolated from all the samples examined.

CARPENTER (J. B.). **A toximetric study of some eradicant fungicides.**—*Phytopathology*, xxxii, 10, pp. 845–856, 1 fig., 2 graphs, 1942.

At the Wisconsin Agricultural Experiment Station the writer investigated the toxicity of elgetol (dinitro-orthocresylate) and three other potential eradicant fungicides, viz., lignasan, a phenyl mercury oleate, and a toluene derivative, to six plant pathogens, i.e., *Venturia inaequalis* from apple [*R.A.M.*, xxi, p. 494], *Cladosporium carpophilum* and *Coryneum beijerinckii* [*Clasterosporium carpophilum*] from peach, *Coccomyces hiemalis* from cherry, *Valsa cincta*, and *Sclerotinia fructicola* from plum. The laboratory experiments were carried out by a modification of the agar-plate method of Schmitz *et al.* [ibid., x, p. 217], and a small-scale study was made of the suppression of the ascospore inoculum of *Venturia inaequalis* in overwintered apple leaves by elgetol.

C. hiemalis proved to be consistently one of the most susceptible of the test fungi, followed in order by either *V. inaequalis* or *Valsa cincta*, the other three being more resistant. The relative susceptibility of the six organisms, however, varied with each eradicant. Under the conditions of the trials, lignasan was the most toxic of the four fungicides, followed in order by the phenyl mercury oleate preparation, elgetol, and the toluene derivative.

Based on equal percentage concentrations of the antiseptic, the toxicity of lignasan was from 3 to 300 times as high as that of any of the other preparations tested, the minimal concentrations required to destroy *Cladosporium carpophilum*, *Coccomyces hiemalis*, *Clasterosporium carpophilum*, *S. fructicola*, *V. cincta*, and *Venturia inaequalis* being 0·0050, 0·0025, 0·0050 and 0·0025 (two isolates), 0·0050 and 0·0075, 0·0050 and 0·0025, and 0·0025 per cent., respectively. All the eradicants except elgetol yielded a toxic vapour at the concentrations tested, an advantage meriting consideration in any interpretation of their relative fungicidal values. Clear-cut specificity of toxic action was shown only by the toluene derivative, which was markedly destructive only to *Coccomyces hiemalis* and *S. fructicola*.

The times required for the death of *V. inaequalis* from exposure to lignasan and elgetol at the maximum concentrations used were three and 24 to 48 hours, respectively. *Clasterosporium carpophilum* was more resistant, and *S. fructicola* more resistant still, to both eradicants.

Elgetol at a strength of 0·5 per cent., applied at the rate of 600 gals. per acre, usually suppressed over 99 per cent. of the ascosporous inoculum of *V. inaequalis* on naturally overwintered Cortland apple leaves in three hours, thereby furnishing additional evidence of the capacity of the fungicide for the rapid arrest of infection at feasible concentrations.

MAIER (W.). **Was wissen wir heute von der Chlorose?** [What is the extent of our present knowledge of chlorosis?]—*Forschungsdienst*, xxiv, pp. 149–169, 1942. [Abs. in *Hort. Abstr.*, xii, 4, p. 195, 1943.]

The following types of chlorosis are discussed with special reference to the occurrence of this disorder in German vineyards [*R.A.M.*, xx, p. 391]: (1) inherited chlorophyll defects, as exemplified in *Coleus hybridus*; (2) infectious chlorosis of virus origin; (3) chlorosis caused by insects, fungi, or bacteria; (4), (5), (6), and (7) chlorosis due, respectively, to weather or soil conditions and deficiencies or excesses of water and soil nutrients; and (8) chlorosis in grafted vines.